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Environmental Risk Assessment - EPR/FP3628SH/P001

Brains Farm Anaerobic Digestion Facility

Japan Environmental Development and Investment UK Limited

CRM.0169.001.PE.R.005

'Experience and expertise working in union'

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Environmental Risk Assessment – CRM.0169.001.PE.R.005

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For:	Japan Environmental Development and Investment UK Limited
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Author:	Daniel Mills, Senior Permitting Consultant
Reviewer:	Peter Cumberlidge, Director

Contents

1.0Introduction 3
1.1 Introduction 3
1.2 Scope of Assessment 3
1.3 Facility Location and Environmental Setting 3
1.4 Permitted Activities 5
1.5 Waste Types, Quantities and Operating Hours 7
1.6 Nearby Sensitive Receptors 8
1.7 Emissions from the Facility 9
2.0Environmental Risk Assessments 11
2.1 Scope of Assessments Completed 11
2.2 Point Source Emissions to Air 11
2.3 Point Source Emissions to Land, Water or Sewer 12
2.4 Fugitive Emissions to Air 12
2.5 Fugitive Emissions to Land and Water 13
2.6 Odour 14
2.7 Noise and Vibration 14
2.8 Pests and Vermin 15
2.9 Mud and Litter 15
2.10 Wastes Generated and Waste Management 16
2.11 Accidents 16
2.12 Climate Change Risk Assessment 17
2.13 Conclusions 20

Tables and Figures

Figure 1.3.1: Proposed Facility Location 4

Table 1.4.1: Regulated Activities 5

Table 1.5.1: Feedstocks 8

Table 1.6.1: Sensitive Receptors 8

Table 1.7.1: Point Source Emissions to Air from the Facility 9

Table 1: Fugitive Emissions to Air 22

Table 2: Fugitive Emissions to Land and Water 24

Table 3: Odour 26

Table 4: Noise and Vibration 27

Table 5: Pests and Vermin 29

Table 6: Mud and Litter 30

Table 7: Accidents 31

Table 8: Climate Change Risk Assessment 43

Drawings and Appendices

Appendix A – Risk Assessments 22

Appendix B – Weather Station Data 38

Appendix C – Noise Impact Assessment 39

Appendix D – Air Quality Assessment 40

Appendix E – Odour Risk Assessment 41

Appendix F – Climate Change Risk Assessment 42

1.0 Introduction

1.1 Introduction

1.1.1 This Environmental Risk Assessment (ERA) has been completed to support the Bespoke Environmental Permit Application for an Anaerobic Digestion (AD) facility (the 'Facility') by Japan Environmental Development and Investment UK Limited (the 'Operator'). This report has been prepared in response to Question 6 on the Environment Agency's Part B2 application form. The permit application reference is EPR/FP3628SH/P001.

1.2 Scope of Assessment

1.2.1 A number of assessments have been carried out to determine the environmental risks posed by the Facility to identify whether the level of risk is considered acceptable together with any relevant mitigation. The assessment has been completed in accordance with the guidance provided on the Environment Agency's Website 'Risk assessments for your environmental permit', 21st November 2023.

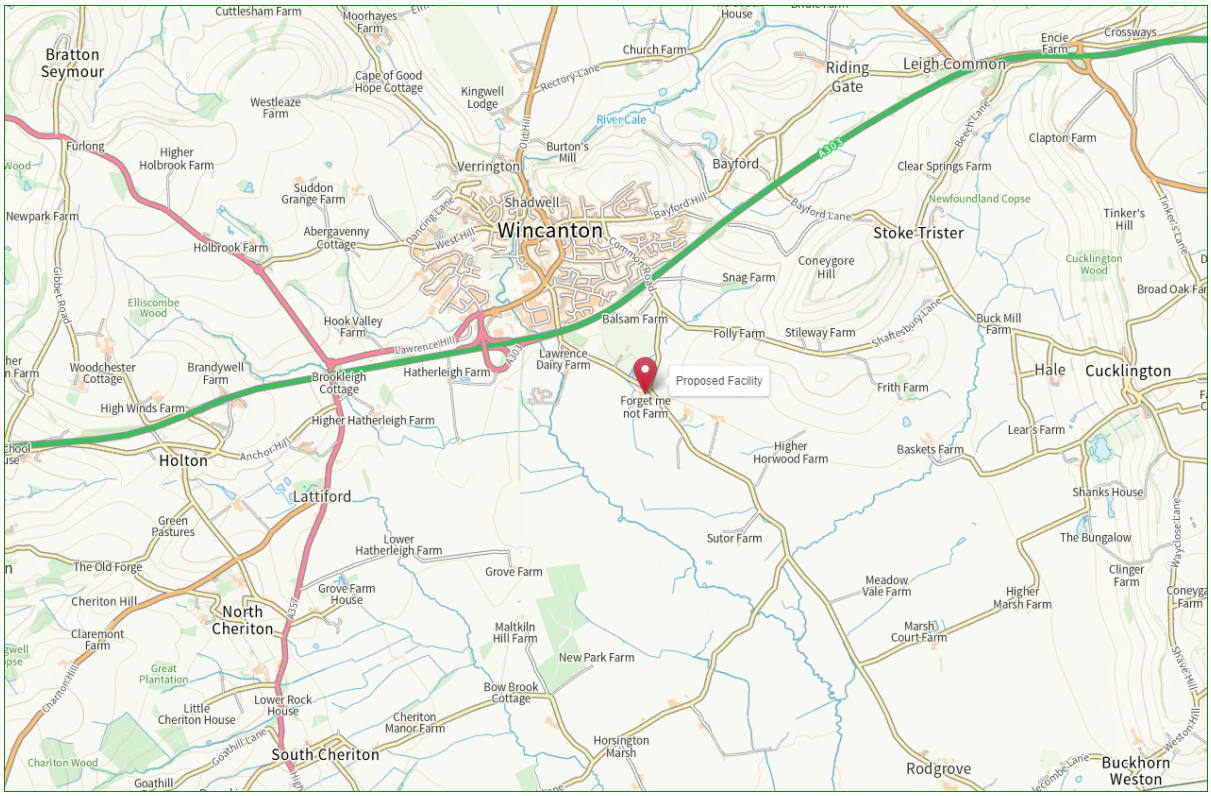
1.2.2 This report contains justification for all risk assessments completed or screened out from requiring further consideration and provides an overall assessment of the acceptability of the proposed activity.

1.3 Facility Location and Environmental Setting

1.3.1 The full address for the Facility will be:

Brains Farm Anaerobic Digestion Facility
Moor Lane
Wincanton
Somerset
BA9 9RA

Figure 1.3.1: Proposed Facility Location



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1.3.2 The proposed Facility's layout is shown on drawing 'Proposed site plan', referenced SA48969-BRY-ST-PL-A-0005_ contained within the Drawings section of this Permit Application.

1.3.3 The National Grid Reference (NGR) for the proposed Facility is ST 71892 27406. The proposed Facility covers an area of approximately 2.8 hectares. The town of Wincanton is located approximately 537m to the northwest of the Facility.

1.3.4 The site currently comprises a combination of arable agricultural land, agricultural buildings, a residential property, concrete hardstanding and drainage ditches. The site is bound by Moor Lane to the north with a pond, recreational sports fields and tennis courts beyond. The site is also bound by Moor Lane to the East with agricultural fields beyond the road. The south and west of the site is bound by agricultural fields.

1.3.5 The nearest residential property to the proposed Facility, following development, will be the residential property at Forget-me-not farm located adjacent to the site's southern boundary.

1.3.6 The nearest surface water feature to the Facility is the drainage ditch which is currently runs through the centre of the site. It is proposed that this watercourse is rerouted as part of the development and will run adjacent to the Facility's southern and western boundaries. The nearest main river, River Cale, is situated approximately 390m west of the site.

1.3.7 A review of the flood map for planning on the Gov.UK website, indicates that the wester corner of the site is located within a Flood Zone 3. The remaining western half of the site is located in a Flood Zone 2 and the eastern half of site is located within a Flood Zone 1. Land lying within a Flood Zone 3 is determined to have a high probability of flooding.

1.3.8 The western half of the site is located over a secondary A aquifer within the superficial geology. The superficial geology aquifer across the eastern half of the site and the bedrock geology across the entire site are designated as unproductive aquifers.

1.3.9 The prevailing winds at the proposed Facility are generally from the southwest and west southwest, with the exception of April and May when the prevailing wind is from the north and west respectively. This data is based on historic daily observation data sourced from the Yeovilton Airport weather station. The weather station is located approximately 16.7km west southwest of the proposed Facility (based on data provided by www.windfinder.com), see Appendix B for details.

1.4 Permitted Activities

1.4.1 The listed activities proposed within this permit application are in accordance with the Environmental Permitting (England and Wales) Regulations 2016 (as amended). Schedule 1 listed activities and Directly Associated Activities (DAAs) are summarised in Table 1.4.1 below.

Table 1.4.1: Regulated Activities

Activity	Description of Activity and WFD Annex I and Annex II operations	Limits of specified activity and waste types
Activity Listed in Schedule 1 of EPR		
Part A (1) Section 5.4 Part A()1) (b)(i) Anaerobic Digestion Plant – Recovery or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 75 tonnes per day (or 100 tonnes per day if the only waste treatment is anaerobic digestion) involving one or more of the following activities, and excluding activities covered by Council Directive 91/217/EEC- (i) biological treatment	**R13:** Storage of wastes pending the operations numbered R1, R3 and D10. **R3:** Recycling or reclamation of organic substances that are not used as solvents.	Total capacity of 50 000 tonnes per annum. Maximum treatment capacity of 172 tonnes per day. But the usual daily treatment capacity will be 137 tonnes.
Directly Associated Activities		
DAA 1 Storage of waste pending recovery or disposal	**R13:** Storage of waste pending the operations numbered R1 and R3 (excluding the temporary storage, pending collection, on the site where it is produced).	From the receipt of permitted waste to pre-treatment and despatch for anaerobic digestion on site. Storage of layer and broiler litter and pig/cattle manure with straw on an impermeable surface with sealed drainage and a cover.

Activity	Description of Activity and WFD Annex I and Annex II operations	Limits of specified activity and waste types
		Storage of vegetable and fruit waste on an impermeable surface with sealed drainage and a cover
DAA 2 Physical treatment for the purpose of recycling	**R3:** Recycling or reclamation of organic substances which are not used as solvents	From the receipt of waste to despatch for anaerobic digestion and/or off site for recovery. Pre-treatment of waste on an impermeable pavement with sealed drainage including shredding, sorting, screening, mixing, compaction, crushing and maceration Gas cleaning by biological or physical (carbon filtration) or chemical scrubbing.
DAA 3 Heat and electrical power supply	**R1:-**Use Principally as a fuel to generate energy	From the receipt of biogas produced at the on-site anaerobic digestion process to combustion with the release of combustion gases. Combustion of biogas within one biogas boiler with a thermal input of 577kW.
DAA 4 Combustion of natural gas in a combined heat and power (CHP) unit	Combustion of natural gas within a CHP unit	Combustion of natural gas within one (CHP) with a thermal input of 2.11MWth.
DAA 5 Emergency flare operation	**D10:** Incineration on land	From the receipt of biogas produced at the on-site anaerobic digestion process to incineration with the release of combustion gas. Use of one auxiliary flare required only during periods of breakdown or maintenance of the biogas upgrading plant and/or biogas boiler.
DAA 6 Combustion of diesel in an emergency generator	Combustion of diesel within an emergency diesel generator	Combustion of diesel within one emergency generator with a thermal input of 410kWth. For use only in an emergency <50 hours per annum.
DAA 7 Gas Upgrading	Upgrading of biogas to biomethane (including the removal of moisture and other substances such as carbon dioxide, hydrogen sulphide and Volatile organic compounds) for injection	From the receipt of biogas produced at the on-site anaerobic digestion process to injection into the medium pressure gas main. This includes return of off-specification biogas for combustion to the on-site, biogas boiler and/or emergency flare.

Activity	Description of Activity and WFD Annex I and Annex II operations	Limits of specified activity and waste types
DAA 8 Biogas Storage	**R13:** Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced)	From the receipt of biogas produced at the on-site anaerobic digestion process to despatch for use within the facility.
DAA 9 Raw material storage	Storage of raw materials including lubrication oils, antifreeze, propane, ferric chloride, activated carbon	From the receipt of raw materials to despatch for use within the facility.
DAA 10 Digestate Storage	Storage of liquid digestate derived from the anaerobic digestion of non -waste feedstocks and waste feedstocks including broiler and layer litter, cattle and pig manure with straw and fruit and vegetable waste only.	From the receipt of processed digestate produced from the on-site anaerobic digestion process to dispatch for use off site. Storage of processed liquid digestate in the on-site covered 4200m³ digestate lagoon. Storage of processed solid digestate
DAA 11 Surface water and groundwater collection and storage	Collection and storage of uncontaminated site surface rainwater	From the collection of uncontaminated roof and site surface water from non-operational areas only to reuse within the facility.

1.4.2 The proposed natural gas fuelled CHP Unit has a net rated thermal input of over 1MWth and therefore falls under the requirements of Schedule 25a of the Environment Permitting (England and Wales) Regulations 2016 (as amended). The CHP will also provide electricity to the facility so will fall under the requirements of Schedule 25b of the Environmental Permitting (England and Wales) Regulations 2016 (as amended).

1.4.3 The biogas boiler has a net rated thermal input of 0.577MWth, therefore does not fall under the requirements of Schedule 25a or Schedule 25b of the Environmental Permitting (England and Wales) Regulations 2016 (as amended).

1.5 Waste Types, Quantities and Operating Hours

1.5.1 Feedstock deliveries and waste collections will take place at the site during the following restricted operational hours:

- Monday to Friday – 07:00 to 19:00
- Saturday – 08:00 to 14:00
- Sunday and bank holidays – no deliveries except during harvest

1.5.2 The treatment of feedstock through the process, the combustion of biogas in the CHP engine and upgrading of Biogas and injection into the grid will operate continuously 24 hours a day, with the exception of downtime for maintenance.

1.5.3 The feedstock to be processed at the Facility will consist of maize, grass, crop silage, chicken manure, pig manure, cattle manure, straw, fruit and vegetables. The Facility will accept a

maximum of 50,000 tonnes of feedstock per year, consisting of a combination of the materials as detailed in Table 1.5.1 below.

Table 1.5.1: Feedstocks

Input Materials	Estimated annual quantity (tonnes)	EWC Code
Maize	15,750	N/a
Broiler and layer litter	10,000	02 01 06
Straw mixed pig and cattle manure	7,500	02 01 06
Straw	6,400	N/a
Grass	4,750	N/a
Whole crop silage	2,850	N/a
Vegetable and fruit waste	2,750	02 03 04

1.5.4 The Operator is applying for a bespoke Part A Installation Environmental Permit to operate an Anaerobic Digestion Facility. The resulting biogas will be upgraded and injected into the gas grid via a network entry facility.

1.6 Nearby Sensitive Receptors

1.6.1 Nearby receptors within 1,000m of the Facility have been identified as part of the ERA. Key receptors that have the potential to be impacted by emissions from the Facility are summarised in Table 1.6.1 below.

1.6.2 There are no Special Protection Areas (SPA), Special Areas of Conservation (SAC) Local Nature Reserves (LNR), National Nature Reserves (NNR), Sites of Special Scientific Interest (SSSI) or Ramsar sites within 5km of the proposed Facility based on a search carried out using Defra's Magic website.

1.6.3 The EAs nature and heritage conservation screening assessment has identified one Local Wildlife Site (LWS) within 2km of the proposed Facility. The Common Lane LWS is located approximately 1,957m south of the site. No further protected sites or species are identified by the EAs nature and heritage conservation screening assessment within the designated screening distance for an AD facility at this site.

Table 1.6.1: Sensitive Receptors

Receptor	Type	Distance (m)	Direction
Secondary A aquifer (superficial geology)	Hydrogeological	-	On site
Unnamed drainage ditch	Hydrological	0	E and S
Forget-me-not farm	Residential and agricultural	0	S
Agricultural land	Agricultural	9	N, E, S and W
Pond	Hydrological and ecological	35	N
Wincanton Sports Ground	Commercial/Recreational	190	NNE
River Cale	Hydrological and ecological	390	W
Home Farm	Residential and agricultural	400	ESE
Laurence Dairy Farm	Residential/ Agricultural	400	NNW
Somerset and Dorset Animal Rescue	Commercial	539	N

Receptor	Type	Distance (m)	Direction
Balsam Farm	Residential	603	N
Chapper's Tailors	Commercial	631	N
Lower Horwood Farm	Residential and Agricultural	641	ESE
Explore Moto	Commercial	650	N
Matt's Respite Retreats	Commercial/residential	661	N
Nearest residence in Wincanton	Residential	673	NNE
Residence on Common Road	Residential	788	N
Bennetts Field Trading Estate	Commercial	800	WNW
Residence on Snag Lane	Residential	857	N
Honeyfield	Residential	912	ENE
Folly Farm	Residential	949	ENE

1.7 Emissions from the Facility

1.7.1 There are 5 no. point source emissions to air at the Brains Farm Anaerobic Digestion Facility which arise from the CHP Engine, Biogas Upgrading System, Emergency Flare, auxiliary biogas boiler and emergency diesel generator.

1.7.2 In addition, there will be 8no. pressure relief valves/air vents which are fitted to the digestate separator, preliminary tank, recirculation tank, 3no. on the pasteurisersation unit and one in each of the anaerobic digestion tanks.

1.7.3 There will be no point source emissions to sewer or surface water of process emissions. All liquid wastes are returned to the anaerobic digestion process.

1.7.4 The majority of the surface water collected within the bunded area on site will be harvested and used as process water within the anaerobic digestion operations. An attenuation pond is included in the design of the Facility to enable collection of rain and uncontaminated surface water for use within the process.

1.7.5 All feedstock storage and handling areas are covered by impermeable reinforced concrete hardstanding served by a sealed drainage system. All effluent captured within the sealed drainage system is directed to 3no. 45 000l tanks for use within the process.

1.7.6 A limited amount of surface water will be discharged from between the site perimeter bund and the bunds for the attenuation pond and digestate lagoon. This clean surface water will be discharged to the rerouted watercourse to the south of the Facility.

1.7.7 The effluent from the office and welfare facilities on site will be <5m³ per day and will be compliant with the Environment Agency guidance 'General binding rules: small sewage discharge to a surface water', updated 2nd October 2023.

1.7.8 The point source emissions described above are summarised in Table 1.7.1 below:

Table 1.7.1: Point Source Emissions to Air from the Facility

Emission Point Reference	Source of Emission	Receiving Media	Emissions
A1	Natural gas fueled CHP Engine	Air	CO, NOx,
A2	Biogas boiler	Air	NOx, SO2, CO, VOC's

Emission Point Reference	Source of Emission	Receiving Media	Emissions
A3	Emissions from the Emergency High Temperature Flare Stack	Air	CO, CO_2, NOx, SO_2, VOCs
A4	Biogas Upgrading Stack	Air	CH_4, CO_2, NOx, VOCs
A5	Emergency diesel generator	Air	CO, CO2, SO2, NOx, VOCs.
Vents	One primary digester tank vent One secondary digester tank vent One separation tank vent Three pasteurizer tank vents Vent on recirculation tank Vent on preliminary liquid feed tank	Air	CO_2, CH_4,, H_2S, NH_4, VOCs
W1	Clean surface water from between site perimeter bund and attenuation pond and digestate lagoon bunds.	Release to watercourse	H_2O
W2	Treated sewage effluent	Release to watercourse	H_2O, NH_3-N, suspended solids

2.0 Environmental Risk Assessments

2.1 Scope of Assessments Completed

2.1.1 This ERA has been compiled to determine the environmental risks posed by the proposed Facility and to ensure there are no significant impacts on the environment or human health, in accordance with regulatory guidance. In accordance with Environment Agency guidance 'Risk assessments for your environmental permit', last updated 21st November 2023, the following potential risks to the environment were considered and either assessed qualitatively in this document or screened out.

2.1.2 This ERA identified the following potential risks to the environment for consideration and inclusion in the assessment, if they are likely to be present:

- point source releases to air;
- point source discharges to surface waters;
- point source discharges to sewer;
- point source discharges to ground or groundwater;
- odour impacts;
- noise and vibration impacts;
- impacts from accidents;
- pests and vermin;
- mud and litter;
- fugitive emissions to air including bioaerosols,
- fugitive emissions to land, surface waters and groundwater; and
- disposal or recovery of wastes produced on site.

2.1.3 Each assessment completed is summarised below with a qualitative assessment of the risks from the proposed Facility provided in Appendix A. Full details of control measures compared with techniques described in the sector guidance is presented in the BAT Assessment and Operational Techniques and Monitoring Plan (OTMP) referenced CRM 0169 001 PE R 006.

2.1.4 Mitigation measures have been proposed where necessary with consideration of Environment Agency Guidance 'Control and monitor emissions for your environmental permit', 24th November 2022 and industry best practise.

2.2 Point Source Emissions to Air

2.2.1 There are 5no. of point source emissions to air from the proposed Facility, as detailed in Table 1.7.1 above.

2.2.2 An Air Quality Assessment (AQA) was undertaken in March 2024 using ADMS 66 (v6.0.0.1). Impacts at sensitive receptors were quantified and the results compared with the relevant Environmental Quality Standards (EQS) and significance criteria provided by the EA.

2.2.3 The AQA concludes that '*Based on the predictions and the use of conservative assumptions, such as worse case emission limit values and meteorological conditions over a 5-year period, it is considered that the overall air quality impacts of the Facility would be insignificant*'.

2.2.4 A copy of the assessment is contained within Appendix D of this report.

2.3 Point Source Emissions to Land, Water or Sewer

2.3.1 The surface water collected within the bunded area on site will predominantly be harvested and used as process water within the anaerobic digestion operations.

2.3.2 However, a limited amount of surface water will be discharged from the non-operational areas of the Facility. The discharged water will be clean surface water which has accumulated between the site perimeter bund and the bunds for the attenuation pond and digestate lagoon. This clean surface water will be discharged to the rerouted watercourse to the south of the Facility.

2.3.3 The discharge point is fitted to a hydro-brake flow control system which will control the flows to the watercourse and can shut off the discharge in the case of an emergency.

2.3.4 The effluent from the site office and welfare facilities will be <5m³ per day and will be compliant with the Environment Agency guidance 'General binding rules: small sewage discharge to a surface water', updated 2nd October 2023. This discharge will also be made to the rerouted watercourse to the south of the Facility.

2.3.5 There will be no further point source emissions to land, water or sewer as part of the proposed activities at the Facility. Point source emissions to land and sewer have therefore been screened out from this assessment.

2.3.6 The residual risk from point source emissions to water is considered to be low.

2.4 Fugitive Emissions to Air

2.4.1 The key sensitive receptors at risk of exposure to potential fugitive emission to air from the Facility have been identified as site employees, Wincanton sports ground, ecological receptors and local residences, including Forget-me-not farm. Environmental sensitive receptors are listed in Table 1.6.1.

2.4.2 The potential fugitive emissions to air from the proposed Facility will be the generation and release of dust, including bioaerosols, and the release of VOCs. The primary sources of the emissions will be from the pretreatment of the straw, the digestate lagoon, the AD process units, gas upgrading units, feedstock loading and storage and from plant and vehicle movements.

2.4.3 Activities at the Facility are managed in accordance with the Operator's management systems, including regular inspections and maintenance of the CHP, Emergency Flare, Biofilter and Biogas Upgrading Unit. The CHP will be monitored annually using MCERTS methods to ensure compliance with permitted limits. SCADA monitoring systems will be used to ensure all equipment is operating at optimal levels.

2.4.4 Pre-treatment of waste will take place in a sealed unit on an impermeable pavement with sealed drainage. The pre-treatment will include mixing and crushing of the solid feedstocks.

2.4.5 The Permit will limit waste types to be accepted at the facility, and will not include dusts, powders, or loose fibres. Waste acceptance and handling procedures minimise the likelihood of the generation of dust.

2.4.6 All waste feedstocks will be stored on impermeable concrete hardstanding served by a sealed drainage system. The waste feedstocks will be covered except during addition or removal from the stockpile.

2.4.7 The digestate lagoon will be covered by a flexible floating cover that will be anchored into the surrounding bund.

2.4.8 All vehicle movements will take place on areas of asphalt or concrete hardstanding. A strict site speed limit of 10mph will be maintained across the Facility. Regular cleaning of all internal haul routes will be carried out and all spillages will be cleaned immediately, to minimise any dust emissions from vehicles.

2.4.9 The residual risk from fugitive emissions to air is considered to be low.

2.5 Fugitive Emissions to Land and Water

2.5.1 All feedstock storage areas are covered by impermeable reinforced concrete hardstanding with sealed construction joints and served by a sealed drainage system. All effluent captured within the gullies is directed through the Facility's sealed drainage system to 3no. 45 000l storage tanks prior to use within the AD process.

2.5.2 The majority of the clean rainwater from the non-operational areas and areas where feedstocks are not stored or handled will be captured separately and directed to the attenuation pond. The waters captured within the attenuation pond are then used as process water within the anaerobic digestion operations.

2.5.3 All waste feedstocks will be stored for a maximum of 72 hours prior to input into the AD process.

2.5.4 All tanks, including the anaerobic digestion tanks, are constructed to CIRIA 736 standard. The tanks are stored within a bunded area capable of containing 20% of the total volume of all tanks within the bund or 110% of the largest tanks volume, whichever is greater.

2.5.5 The liquid digestate lagoon is constructed of an impermeable liner with leak detection installed below. The dirty water storage tanks are constructed of impermeable plastic and fitted with a leak detection system. The drainage system and lagoon are inspected and maintained on a regular basis as part of the routine site checks.

2.5.6 High level alarms and automatic shut off valves are fitted on all storage tanks and controlled by the SCADA system. The level of the digestate storage lagoon will be monitored on a daily basis with a freeboard of at least 750mm maintained at all times.

2.5.7 Secondary containment is present within all anaerobic digestion tank filling and emptying areas and spill kits are on hand. Refuelling of equipment in dedicated areas with impermeable surfacing and spill kits are located in close proximity. All staff undertake training on the use of the spill kits and report all incidents.

2.5.8 A programme of planned preventative maintenance is undertaken at the Facility. All primary and secondary containment systems and hardstanding areas are regularly inspected with any repairs carried out promptly and records kept.

2.5.9 The clean and dirty surface water drainage systems can be shut off on site, so in case of emergencies the surface water can be sealed to prevent any contamination entering the dirty water storage tanks, attenuation pond or watercourse to the south.

2.5.10 The residual risk from fugitive emissions to water and land is considered to be low.

2.6 Odour

2.6.1 An Odour Risk Assessment was carried out by Enzygo in March 2024 to assess the odour impacts from the proposed Facility. A copy of this assessment can be seen in Appendix E.

2.6.2 The Odour Risk Assessment was undertaken in accordance with the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Odour for Planning - Version 1.1, July 2018 and the Environment Agency guidance 'Environmental Permitting: H4 Odour Management', April 2011.

2.6.3 The predicted odour concentrations were below the EA benchmark level at all sensitive receptors in the vicinity of the site for all modelled years. In addition, maximum impacts were shown to be slight at one residential receptor location and two recreational receptor locations. All other locations were predicted to experience negligible impacts.

2.6.4 The report concludes that '*given the robust assumptions made on odour emissions, the overall odour impacts generated by the Facility can be considered as acceptable and not significant*'.

2.6.5 An Odour Management Plan (OMP) has been prepared by Enzygo Limited to support this application referenced CRM.0169.001.PE.R.008. The OMP has been prepared to:

- Establish the likely sources of odour arising from the Facility;
- Set out the procedures followed at the plant in order to prevent or minimise odour emissions; and
- Formalise the procedures for dealing with any our complaints.

2.6.6 In accordance with Environment Agency Guidance H4: Odour Management, the OMP is designed to:

- Employ appropriate methods, including monitoring and contingencies, to control and minimise odour pollution;
- Prevent unacceptable odour pollution at all times; and
- Reduce the risk of odour releasing incidents or accidents by anticipating them and planning accordingly.

2.6.7 The control measures identified within the Odour Management Plan will be transposed into the Facility's Environmental Management System.

2.7 Noise and Vibration

2.7.1 A Noise Impact Assessment was conducted for the site by Enzygo Limited in March 2024. The BS4142:2014+A1:2019 assessment included a background sound survey and quantification of the noise from the AD facility upon the closest residential receptors. A copy of this assessment is contained within Appendix C of this report.

2.7.2 The Noise Impact Assessment states that '*it is concluded that noise from the facility would not result in any sustained adverse noise impacts on any of the receptors in the vicinity of the development*'.

2.7.3 Based on this assessment outcome the report has not recommended any additional noise mitigation measures for the Facility.

2.7.4 The potential hazard from vibration is low based on the limited sources of vibration and the control measures to be put in place. The plant used at the Facility will be no different to that used in the daily agricultural activities currently carried out on site.

2.7.5 Vibration has therefore been discounted as a potential hazard and no further assessment has been undertaken.

2.8 Pests and Vermin

2.8.1 As biodegradable waste will be processed at the Facility there is the potential for pests such as flies, vermin and mammals.

2.8.2 Wastes are delivered to the appropriate clamp, to maintain separation of waste types, until required. Deliveries of energy crops are deposited straight into the silage clamps which remain covered apart from during delivery of feedstock or removal for addition into the AD process.

2.8.3 All waste storage areas are periodically emptied entirely and cleaned in order to prevent the build-up of older wastes. The Facility will follow the first-in, first-out principle but will prioritise dealing with wastes with a higher risk of causing odour, litter or pest problems.

2.8.4 Cleaning procedures ensure any spills and litter around the site are cleared up immediately.

2.8.5 A vermin/pest control contract will be set up with a pest control contractor. Records of all vermin and pest control visits and incidents are maintained and available for inspection.

2.8.6 The residual risk of pests is therefore considered to be low.

2.9 Mud and Litter

2.9.1 It is unlikely that there will be any litter generated on site. All feedstocks will be delivered to site in road going wagons or trailers and tipped into the appropriate storage area, generating no litter.

2.9.2 General housekeeping measures detailed within the site's Environmental Management System will ensure any other litter generated on site is minimal and does not escape into the environment.

2.9.3 There is limited potential for mud to be generated on site as the majority of the site area and access road comprises hardstanding. It is however possible that mud will be brought onto site by feedstock delivery vehicles.

2.9.4 Wheel washing facilities will be available on site to ensure vehicles leaving the site do not track mud onto the adjacent roads and housekeeping measures will reduce the build-up of materials on site.

2.9.5 The residual risk from mud or litter impacting the identified receptors is considered to be low.

2.10 Wastes Generated and Waste Management

2.10.1 Minimal waste will be generated at the Facility. General waste will be collected under contract with a local waste disposal contractor.

2.10.2 The digestate generated by the Facility will be PAS 110 compliant and used on the surrounding agricultural land for irrigation and as a soil improver.

2.10.3 Contingency arrangements will be put in place for dealing with any untreated or partially treated materials in the event of the Facility being unable to process the materials.

2.10.4 The waste hierarchy will be applied to all waste generated at the Facility.

2.11 Accidents

2.11.1 There is potential for exposure from accidents or incidents on site to all sensitive receptors identified.

2.11.2 Key potential hazards identified include vehicles on site, fires and spillages resulting from arson and vandalism, accidental explosion of biogas, failure of plant and equipment on site and accidental fires. Although these are recognised as potential risks, the likelihood of them occurring remains low.

2.11.3 The qualitative risk assessment provided within Appendix A of this report concludes that if appropriately managed, the residual risks posed would remain low. Proposed management and mitigation controls include the following:

- Activities will be managed and operated in accordance with a written management system (which will include the Accident Management Plan produced as part of this application, referenced CRM 0169 001 PE R 009);
- The risk of explosion of biogas is considered to be an unlikely event if the site is effectively managed and Lightning protection is installed to BS EN 62305;
- All plant and equipment is monitored with a SCADA control system which identifies abnormal operation. If necessary, biogas can be directed to the emergency flare, or if this fails can be released via emergency pressure valves;
- The anaerobic digestion tanks are located within a bunded area sized to contain 110% of the largest tank and 25% of the combined volume of the two tanks. Containment systems are designed, manufactured and installed in accordance with CIRIA 736 guidance;
- All fuel and chemicals stored on site will be in sealed, leak resistant containers with appropriate secondary containment. Containers are regularly inspected for leaks, located on impermeable concrete hardstanding and incompatible chemicals are stored in separate locations;
- A Site Traffic Management Plan will be in place and all delivery and collection vehicle drivers briefed on the STMP before entering the Facility. The STMP will include details on speed limits, one way systems and vehicle and pedestrian routes; and
- Shutoff valves are fitted to the clean and dirty water drainage systems to prevent the migration of any contamination or firewater through these systems.

2.11.4 The residual risk from accidents on site, if all identified mitigation measures are implemented, is considered to be low.

2.12 Climate Change Risk Assessment

Overview

2.12.1 This section addresses the requirements of the 'a changing climate' section of the Environment Agency guidance 'Develop a management system: environmental permits', last updated 3rd April 2023.

2.12.2 The following Climate Change Risk Assessment (CCRA) and adaptation planning follows the six-stage approach detailed within the Environment Agency guidance 'Climate change: risk assessment and adaptation planning in your management system', last updated 3rd April 2023.

Scope

2.12.3 The CCRA will describe the main climate change risks specific to the site. Each risk scenario will be assessed using EA Risk Assessment guidance to determine whether each scenario presents a high, medium or low risk using the six-stage approach described in the guidance:

1. Preparation
2. Find potential impacts.
3. Complete your risk assessment.
4. Find control measures.
5. Write your adaptation plan.
6. Monitor, record and review your plan.

Regulatory Guidance

2.12.4 The risk assessments will be developed with reference to the EA's guidance 'Develop a Management System: Environmental Permits', last updated 3rd April 2023, and the following connected EA guidance notes:

- Climate change: risk assessment and adaptation planning in your management system, Plan for climate change impacts to and from your site. How to integrate climate change adaptation into your management system under an environmental permit, EA, last updated 3rd April 2023.
- Guidance - Biowaste: examples for your adapting to climate change risk assessment, EA, last updated 17th May 2023.
- Preparing for flooding: a guide for regulated sites. Flood planning guide to help businesses comply with their environmental permit and the COMAH regulations, EA, last updated 30th June 2015.

Step 1: Preparation

2.12.5 The Facility is newly constructed and has been designed with potential future impacts of climate change taken into consideration. The measures implemented at the site include the following:

- Emergency response plan in place which considers severe weather and natural disasters including flooding.

- Robust design of plant and equipment.
- Capture and storage of surface water for use within the process.
- Flow control on surface water discharge point.
- Rerouting of existing watercourse which will include improvement works and a flood alleviation zone in the adjacent agricultural land.
- Raising of the site levels and installation of bunding around the site perimeter.
- Tanks are provisioned with bunds which meet the requirements of CIRIA C736.
- Oil tanks comply with Oil Storage Regulations requirements comprising a double skinned containers.
- Impermeable concrete hardstanding is installed in operational areas to prevent spills reaching exposed ground or groundwater.
- EMS in place to identify and mitigate the impact from significant environmental risks.
- Accident Management Plan in place to identify accident scenarios, implement preventative measures and mitigate the risks should an accident occur.
- Contingency arrangements are in place to divert feedstocks and manage digestate in the event of an emergency, including scenarios relating to climate change, see appendix F.

Step 2: Identifying Potential Impacts

Increasing Summer Temperatures

2.12.6 This may be around 7°C higher compared to average summer temperatures now, with the potential to reach extreme temperatures as high as over 40°C with increasing frequency based on today's values.

2.12.7 The following potential impacts have been identified for the site and any potential risk created regarding Permit compliance.

- Overheating of vessels and pipework at anaerobic digestion plants, requiring increased insulation and cooling.
- Potential for increased fires involving combustible waste stockpiles.
- Increased changes in feedstock, low nitrogen waste (less grass) and slower processing times.
- There could be an increase in dust and bioaerosol emissions from the site.
- Increased pests and flies.
- Lower gas uptake from National Grid affecting grid demand.
- There could be an increase in odour from the site.

Winter Temperature Profile Changes

2.12.8 Winter temperatures could be 4°C more than the current average, however with the potential for more extreme temperatures, both milder and colder than present.

2.12.9 The following potential impacts have been identified for the site and any potential risk created regarding Permit compliance.

- Longer growing seasons resulting in a change in the feedstocks.
- Poor crop yields and feedstock scarcity for anaerobic digestion could lead to reduced digester performance.
- In extreme cold weather, risk of freezing of feed water, resulting in blockages – particularly on long pipelines and storage in exposed areas.
- Frozen onsite roadways may restrict access for staff and emergency vehicles.
- There could be damage to site infrastructure from snow-loading over extended periods.

Daily extreme rainfall

2.12.10 Daily rainfall intensity could increase by up to 20% on today's values and average winter rainfall may increase by over 40% on today's averages.

2.12.11 The following potential impacts have been identified for the site and any potential risk created regarding Permit compliance:

- Unstable process conditions for AD sites causing temperature fluctuations and increased odours.
- Land bank availability for spreading digestate may experience extreme difficulty due to prolonged wet weather.
- Leachate storage risk of over-topping.
- Localised flood events.
- Potential for increased site surface water and flooding.
- Access or egress to/from site could be affected.

Sea level rise

2.12.12 Sea level rise which could be as much as 0.6m higher compared to today's level. However, the site is located approximately 69m above sea level and is located over 40km away from the coast.

Drier summers

2.12.13 Summers could see potentially up to 40% less rain than now.

2.12.14 The following potential impacts have been identified for the site and any potential risk created regarding Permit compliance:

- Increased need for water for digesters.
- Poor crop harvest and reduced feedstock.

River flow

2.12.15 The flow in the watercourses could be 50% more than now at their peak and 80% less than now at their lowest. Discharge of waters during increased river flows may therefore increase the flood risk from the watercourse further downstream.

2.12.16 Reduced river flows also mean that there is also a risk of reduced dilution available in receiving watercourse in the event of a spill, increasing potential for damage from pollution.

Storms

2.12.17 Storms could see a change in frequency and intensity. The unique combination of increased wind speeds, increased rainfall, and lightning during these events provides the potential for more extreme storm impacts.

2.12.18 Storms and high winds could damage building structures with increased potential for fugitive emissions is identified as an impact.

Steps 3 and 4: Risk assessment and Control Measures

2.12.19 Stages 3 and 4 of the six-stage approach are covered within the climate change risk assessment shown in Table 8 contained within Appendix F.

Step 5: Adaption Plan

2.12.20 The current control measures are suitable for the currently predicted climate change impacts for the site. The Facility is newly constructed and the anticipated climate change impacts at the site have been considered throughout the design and construction.

2.12.21 The climate change risk assessment and adaption plan will be reviewed annually along with the Facility's EMS and will fulfil Step 6 of the six-stage approach. The climate change risk assessment and adaption plan will also be reviewed following any changes to the predicted climate impacts, flood zone designations or climate change related incidents at or near to the site.

2.12.22 Regular reviews of the Facility's Environmental Risk Assessment, Flood Risk Assessment and emergency procedures will be carried out to reflect changes to the conditions on site. There will also be a review of these assessments and procedures should any climate incident occur at or near to the site e.g. flooding event.

2.13 Conclusions

2.13.1 The assessments undertaken consider the possible impacts on sensitive receptors from a range of potential emissions from the Facility. The risk assessments have considered both the intended design and operational practices at the Facility and conclude that:

- The air quality assessment confirms that even when based on the use of worst-case emissions, it is considered that overall air quality impacts associated with the operation of facility would be not significant.
- The noise impact assessment confirms that the activities at the facility will not result in any sustained adverse noise impacts at any of the receptors in the vicinity.

- The overall risk to receptors from accidents, climate change, odour and fugitive emissions to air, land and water is considered low following implementation of management measures and controls.

- The overall risks from vibration, mud, litter and pests are considered very low due to the nature of the wastes and treatment processes carried out.

2.13.2 Full details of control measures to minimise the impact of accidents compared with requirements detailed in the relevant technical guidance notes is described in the OTMP, referenced CRM 0169 001 PE R 006.

Table 1: Fugitive Emissions to Air

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
Releases of gaseous emissions above permit limits	Point source emissions	Transportation through air then inhalation or deposition	Commercial and residential receptors; site employees; watercourses; ecological receptors; surrounding agricultural land.	Low	Medium	Medium	Activities on site are managed in accordance with the Operator's management systems, including regular inspections and maintenance of the CHP, Emergency Flare, Auxiliary Boiler and Biogas Upgrading Unit. The CHP, Biogas Upgrading Plant and Auxiliary Boiler will be monitored annually using MCERTS methods to ensure compliance with permitted limits. SCADA monitoring systems will be used to ensure all equipment is operating at optimal levels.	Low
Releases of particulate matter (dust) and bioaerosols	Fugitive releases of dust and/or bio-aerosols from the Facility; releases from feedstock delivery vehicles	Transportation through air then inhalation or deposition	Commercial and residential receptors; site employees; watercourses; ecological receptors; surrounding agricultural land.	Low	Medium	Medium	Wastes and silage are covered to prevent release of dusts, odour and bioaerosols. Pretreatment of wastes takes place within a sealed unit. Activities on site are managed in accordance with the operator's management systems. Regular inspections and maintenance of equipment to ensure they continue to operate at optimum conditions. Good housekeeping practices are applied, such as: regular inspections and	Low

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
							cleaning/sweeping of all paved areas on site and sealed deliveries of feedstock. The site area and access road comprise concrete and asphalt hardstanding minimising the potential for dust to be generated by vehicles entering and exiting the site. Wheel washing facilities will be available on site should any vehicles bring in mud from off site. Site traffic management plan in place with strict speed limit of 10mph. Monitoring of bioaerosols in line with the Permit conditions. Digestate lagoon is covered by flexible floating cover, which is anchored in the surrounding bund. Prevailing wind direction is away from the nearest residential receptor.	
Releases of VOC's	Fugitive releases of dust and/or bio-aerosols from the Facility; releases from feedstock delivery vehicles	Transportation through air then inhalation or deposition	Commercial and residential receptors; site employees; watercourses; ecological receptors;	Low	Medium	Medium	The CHP, biogas upgrading plant and auxiliary boiler will be maintained to ensure they are operating at optimal conditions, and not releasing VOC's above normal/permitted limits. Emissions of VOCs from the pressure release valves will only occur in emergency situations, where the emergency flare has failed. All records of their use will be maintained.	Low

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
			surrounding agricultural land.				SCADA monitoring systems will be used to ensure all equipment is operating at optimal levels. Solid digestate will be stored in a concrete bay before being transferred off-site. Digestate lagoon is covered by flexible floating cover, which is anchored in the surrounding bund.	

Table 2: Fugitive Emissions to Land and Water

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
Contaminated run-off from site surfaces	Loss of containment on site	Percolation through soils, direct run-off from site across the ground	Underlying groundwater and land; watercourses; local residences.	Medium	Medium	Medium	All potentially polluting materials are contained within bunded areas and located in impermeable surfaces. All main liquid storage and treatment vessels are constructed to CIRIA 736 standard and located within a sealed bunded area sized to contain 110% of the largest tanks capacity or 25% of the maximum volume of all the material stored within the bund. All process water from within the AD system will be fully contained within the plant and/or associated pipework.	Low

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
							The site is served by a separate sealed drainage networks for clean and dirty areas with surface waters captured for use within the process. Emergency shutoff valves are fitted to clean surface water discharge outlet. Spill clean-up procedure in place to minimise the impact from spills and leaks.	
Release from digestate lagoon	Loss of Containment on site	Percolation through soils, direct run-off from site across the ground	Underlying groundwater and land; watercourses; local residences.	Medium	High	High	Lagoon is regularly inspected and periodically emptied to enable full inspection. A leak detection system is installed at the digestate lagoon and a programme of planned preventative maintenance is undertaken at the Facility Spill clean-up procedure in place to minimise the impact from spills and leaks. The level of the digestate storage lagoon is monitored on a daily basis with a freeboard of at least 750mm maintained at all times. Digestate lagoon is covered to prevent rainwater ingress.	Low
Release from storage tanks (fuels and dirty water)	Loss of Containment on site	Percolation through soils, direct run-off from site across the ground	Underlying groundwater and land; watercourses; local residences.	Medium	Medium	High	Regular inspection of the storage tanks to identify leaks. Spill clean-up procedure in place to minimise the impact from spills and leaks. Tanks are constructed to CIRIA 736 standard and located within a sealed bunded area sized to contain 110% of the largest tanks	Low

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
							capacity or 25% of the maximum volume of all the material stored within the bund. High level alarms and automatic shut off valves are fitted on all storage tanks and controlled by the SCADA system. Secondary containment is present within all tank filling and emptying areas and spill kits are on hand	

Table 3: Odour

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
Odour from feedstock while transported to the Facility	Vehicles	Transportation through air then inhalation or deposition	Site employees; Local residents.	Medium	Medium	Medium	Feedstock will be delivered to the site via road. Any liquid waste will be delivered directly to the preliminary tank. OMP in place to prevent and minimise odorous releases.	Low
Release of odours from stored materials and AD plant operations	Fugitive releases of odours from feedstocks and processes	Transportation through air then inhalation or deposition	Site employees; Local residents.	High	High	High	Wastes and silage is stored in clamps and covered with protective sheeting. Waste feedstocks are stored for a maximum of 72 hours before input into the process. The Facility operates a first in first out policy to prevent the build up of older feedstocks.	Low

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
							The digestion process, including pretreatment, is largely sealed minimising the potential for odour releases. Activities on site are managed in accordance with the operator's management systems. This includes regular inspections and maintenance of equipment to ensure they continue to operate at optimum conditions. OMP in place to prevent and minimise odorous releases. Prevailing wind direction is away from the nearest residential receptor.	

Table 4: Noise and Vibration

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
Noise	Plant and equipment producing noise including vehicle movements	Transportation through air	Local residential and commercial receptors.	Low	Medium	Low	Noise and vibration management plan in place to prevent and minimise impacts. Noise assessment carried out for the site showing no sustained adverse impacts. Delivery times limited to: Monday to Friday – 07:00 to 19:00 Saturday – 08:00 to 14:00	Low

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
							Sunday and bank holidays – no deliveries except during harvest Plant and equipment to be regularly inspected for abnormal operation with a programme of planned preventative maintenance.	
Vibration	Vibration from plant and equipment at the Facility including vehicle movements	Transportation through the ground	Local residential and commercial receptors.	Low	Medium	Low	Noise and vibration management plan in place to prevent and minimise impacts. Vibration will be minimal but any issues to be resolved during commissioning process. Delivery times limited to: Monday to Friday – 07:00 to 19:00 Saturday – 08:00 to 14:00 Sunday and bank holidays – no deliveries except during harvest Plant and equipment to be regularly inspected for abnormal operation with a programme of planned preventative maintenance.	Low

Table 5: Pests and Vermin

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
Vermin and flies attracted to feedstocks	Pests	Travel across air and/or land	Local residential and commercial receptors; site employees.	Low	Medium	Low	The primary areas at most AD facilities that attract pests are the feedstock reception and storage areas. The silage and manure storage areas are sheeted apart from during feedstock deliveries and removal. Digestate storage lagoon is covered. Cleaning procedures ensure any spills and litter around the site are cleared up immediately. A vermin/pest control contract will be set up with a pest control contractor should pests be found to be inhabiting the facility. Records of all vermin and pest control visits and incidents are maintained and available for inspection. The Facility operates a first in first out policy to prevent the build-up of older feedstocks.	Low

Table 6: Mud and Litter

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
Mud	Mud from vehicle movements	Transportation over land (roadways)	Local residential and commercial receptors; site employees.	Low	Medium	Low	Wheel washing facilities are present on site and can be used if required. Internal access and haul roads will be swept when required. All vehicle movements will take place on concrete or asphalt hardstanding.	Low
Litter	Litter from operations	Transportation through the air and over land	Local residential and commercial receptors.	Low	Medium	Low	Feedstocks are delivered loose, with no packaging, in covered wagons or trailers. A high standard of housekeeping will be maintained through regular checks for any litter and debris. Wastes generated will be stored securely in covered skips/bins. Any issues identified will be recorded, investigated and appropriate remedial action will be taken as soon as practicable.	Low

Table 7: Accidents

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
Vehicle Collision/ impact	All on-site hazards: wastes, machinery and vehicles	Direct Physical Contact	Drivers; site employees; local environmental receptors.	Low	High	Medium	Vehicle movements are scheduled and directed onto site by staff. Activities on-site are managed and operated in accordance with a management system (which includes site security measures to prevent unauthorised access). A speed limit of 10mph is enforced across the site and signage is clearly displayed at the entrance.	Low
Explosion of biogas	Digester tanks, Post digester tank, Gas upgrading compound	Transportation through air	Site employees; Ecological receptors; Surrounding farmland.	Low	High	Medium	Activities are managed and operated in accordance with the Operator's management system and monitored with SCADA systems. If abnormal operation occurs, or an issue is perceived, gas will be directed to the site's emergency flare. Should the emergency flare fail, digesters and upgrading unit are fitted with emergency pressure release valves to avoid overpressure. All records of the use of PRVs will be kept on site and the reason for use documented. Should an explosion compromise the integrity of any tank, the tanks are located within an area of bunding sized to contain 110% of the largest tank and 25% of the combined tank volume. Containment systems are designed,	

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
							manufactured and installed in accordance with CIRIA 736 guidance. Lightning protection is installed to BS EN 62305	
Arson and / or vandalism causing the release of polluting materials to air (smoke or fumes), water or land.	Unauthorised Access	Transportation through air then inhalation/ deposition; Release of contaminants through surface water drainage system.	Site employees; local residential and commercial receptors; ecological receptors; watercourses; surrounding farmland.	Medium	High	High	The site is fenced to prevent unauthorised access and is under 24hr surveillance from a security contractor. Access gates are kept locked outside of delivery hours. All visitors must first report to the site office for an induction and be escorted across the site if required. Oils and fuels are stored in lockable tanks with bunding sized to contain 110% of the largest tank and 25% of the combined tank volume. Activities are managed and operated in accordance with a management system which includes fire and spillage procedures. Process areas where liquids are stored are constructed of concrete hardstanding. Surface waters are mostly captured and stored on site. Clean surface water discharge point is fitted with shutoff valve to prevent the release of contaminants.	Low
Contaminated run-off from site surfaces	Loss of containment on site,	Percolation through soils or direct run-	Ecological receptors;	Medium	Medium	Medium	Process areas where liquids are stored are constructed of concrete hardstanding.	

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
mobilising pollutants off site	spillage or leakage of liquids, oils or fuels	off from site entering surface watercourses	watercourses; surrounding farmland.				Potentially contaminated surface water is captured by the surface water drainage system and stored in tanks below ground prior to use in the process. Uncontaminated surface water run-off is directed to the attenuation pond. Clean surface water discharge point is fitted with shutoff valve to prevent the release of contaminants. Any spills on site will be cleaned up immediately with spill kits available for this purpose and staff trained in spill response procedures. Digestate and other liquids are contained within sealed tanks. The tanks are located within an area of bunding sized to contain 110% of the largest tank and 25% of the combined tank volume. Containment systems are designed, manufactured and installed in accordance with CIRIA 736 guidance. All maintenance fluids stored on site will be in sealed, leak-resistant containers with appropriate secondary containment. Containers are regularly inspected for leaks, located on impermeable concrete hardstanding and incompatible chemicals are stored in separate locations.	

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
Accidental fire causing the release of pollution to air, water or land	On site machinery. Combustion of feedstock or digestate.	Transportation through air. Surface water or percolation through soil	Commercial and residential receptors; site employees; watercourses; ecological receptors; surrounding farmland.	Medium	High	High	All plant and equipment on site are maintained to the manufacturer's specification, with details incorporated into the site's EMS. The main plant areas are provided with secondary containment. Drainage can be sealed to contain firewater on-site and can be directed to and stored in the on-site attenuation pond to ensure contaminated water will not be released to the local environment in the case of a fire. Firewater will be evaluated and disposed of by authorised waste contractor. Smoking is prohibited anywhere on site and is clearly signed. Any abnormal operation of the gas upgrading equipment will be detected by the SCADA system and if necessary, biogas can be directed to the emergency flare. If for any reason this fails, pressure release valves will be utilised to release excess gas. All records of their use will be maintained. Risk of self-combustion of waste is low, as the majority of material feedstock into the installation has a high-water content and is pumped directly into the plant for processing. Crops (maize, grass, wholecrop and wheat straw) are unloaded into the clamps when	Low

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
							they arrive on site and are covered using protective sheeting. Manure and fruit and vegetable waste is delivered to the site on a weekly basis and stored in the clamps and covered. Input materials will be processed on a first-in first-out basis. The risk of self-combustion is therefore considered to be low.	
Plant and equipment breakdown and/or failure causing releases of potentially polluting substances	On site infrastructure (digestion tank, biogas upgrading unit, CHP, auxiliary boiler, digestate lagoon, dirty water storage tanks and attenuation pond)	Transportation through air, Surface water drainage system, percolation through soil	Commercial and residential receptors; site employees; watercourses; ecological receptors; surrounding farmland.	High	High	High	All plant and equipment on site are maintained to manufacturer's specification and regularly integrity checked. All details are incorporated into the site's EMS. The SCADA system will identify any abnormal operations prior to any catastrophic failure and automatically notify the operator. The programme will shut off equipment if it reaches unsafe limit set points. If necessary, gas can be directed to the emergency flare. All operations will cease in the event of plant failure, with waste directed to an alternative site where necessary. Digestate and other liquids are contained within sealed tanks. The tanks are located within an area of bunding sized to contain 110% of the largest tank and 25% of the combined tank volume. Containment systems are designed, manufactured and installed in accordance with CIRIA 736 guidance.	Low

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
							The digestate lagoon is double lined with an impermeable liner and leak detection system. Digestate lagoon is covered with a flexible floating cover.	
Spillage of feedstock from tankers during delivery or off loading	Feedstock delivery vehicles; Tank filling/ emptying points	Surface water drainage system and/or percolation through soils	Ecological receptors; watercourses; surrounding farmland.	Low	Medium	Low	Activities are managed and operated in accordance with the Operator's management system, with trained operatives directing tankers to input liquid feedstock directly into the plant for processing. The waste reception areas comprise concrete hardstanding with sealed drainage, preventing any spillages reaching soils or clean surface water drains. Secondary containment is installed at all filling and emptying points. Spill kits will be on hand to address minor spills and site operatives will be trained in their use.	Low
Accidental release of potentially polluting substances through flooding	Loss of containment, contaminated flood water	Percolation through soils or direct run-off from site entering surface watercourses	Local residential and commercial receptors; ecological receptors; watercourses; surrounding farmland.	High	High	High	Site levels are to be raised during construction and a new flood alleviation zone created in the adjacent agricultural land. Watercourse is to be redirected during construction with a new channel formed around the site. Chemicals and oils are stored in impermeable containers and are provided with secondary containment.	Low

Hazard	Source	Pathway	Receptor	Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk
							All site areas are constructed of impermeable concrete and asphalt surfacing. Drainage systems divert capture and store almost all surface water at the site. Flow control system is fitted to the clean surface water discharge point. Clean surface water discharge point can be shutoff in case of flooding.	
Failure of buffer tank, digester tanks or digestate storage lagoon	Loss of containment	Direct physical contact; Percolation through soils, direct run-off from site across the ground	Local residential and commercial receptors; site employees; Underlying ground and groundwater; watercourses.	Medium	High	High	All tanks and lagoons are inspected regularly in line with the Facility's EMS to identify any leaks. The tanks are connected to the Facility's SCADA system and telemetry systems which monitor levels, pressure and foam within the tank continuously. A spill clean-up procedure is in place which is designed to minimise the impact on the environment in the case of any spills. The tanks are located within their own bund which is sized to contain 110% of the largest tank and 25% of the combined tank volume. Containment systems are designed, manufactured and installed in accordance with CIRIA 736 guidance. Digestate lagoon is double lined with leak detection system installed.	Low

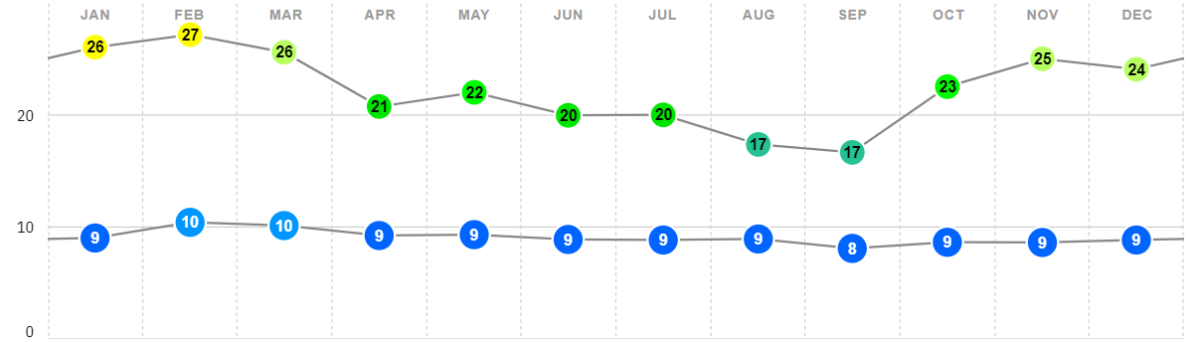
Statistics based on observations taken between 09/2009 - 09/2023.

Monthly wind speed statistics and directions for Yeovilton Airport

Dominant wind direction

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
SW	SW	SW	N	W	WSW	WSW	WSW	WSW	SW	SW	SW

Average wind speeds and gusts (kts)



Appendix C – Noise Impact Assessment

Noise Impact Assessment

Anaerobic Digestion Plant, Moor Lane, Wincanton

Japan Environmental Development & Investment UK Ltd

CRM.0169.001.NO.R.001

'Experience and expertise working in union'

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Noise Impact Assessment

Project:	Anaerobic Digestion Plant, Moor Lane, Wincanton
For:	Japan Environmental Development & Investment Ltd
Status:	Final
Date:	March 2024
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Contents

Non-Technical Summary 4

1 Introduction 5

2 Standards and Guidance 9

3 Baseline Noise Monitoring Survey 12

4 Noise Assessment 16

5 Summary of Uncertainty 22

6 Conclusion 23

Glossary of Terminology 24

Statement of Competency 27

Tables & Figures

Table 1-1: Assessment Locations 6

Figure 1-1: Site Location 6

Figure 1-2: SA48969-BRY-ST-PL-A-0005 7

Table 1-2: Operational Hours 8

Table 2-1: BS4142 Subjective Method Rating Corrections 10

Table 3-1: Noise Monitoring Locations 12

Table 3-2: Weather Conditions 12

Table 3-3: Noise Monitoring Equipment 13

Table 3-4: Summary of Baseline Survey Results 14

Table 3-5: Background Sound Level Analysis 15

Table 4-1: Modelled Source Emissions 16

Table 4-2: Predicted Specific Sound Levels – Typical Operation 18

Table 4-3: Predicted Specific Sound Levels – Peak Operation 18

Table 4-4: Predicted Specific Sound Levels – Emergency Operation 19

Table 4-5: BS4142 Assessment – Typical Scenario 20

Table 4-6: BS4142 Assessment – Peak Scenario 20

Table 4-7: BS4142 Assessment – Emergency Scenario 20

Table G-1: Typical Noise Levels 24

Table G-2: Terminology 25

Location M01 Data 28

Location M02 Data 31

Figure B-1: Noise Contour Plot (L_{Aeq}) – Typical Daytime (1.5m) 35

Figure B-2: Noise Contour Plot (L_{Aeq}) – Typical Night (4m) 36

Figure B-3: Noise Contour Plot (L_{Aeq}) – Peak Daytime (1.5m) 37

Figure B-4: Noise Contour Plot (L_{Aeq}) – Emergency Night (4m) 38

Non-Technical Summary

Enzygo Limited has been commissioned by Japan Environmental Development & Investment UK Ltd to undertake an environmental noise impact assessment to support an environmental permit application for an Anaerobic Digestion facility on land at Moor Lane, Wincanton, Somerset.

The assessments have used baseline noise levels for the area, established in February 2024, at locations representative of the nearest noise-sensitive receptors to the site. The measurements informed the derivation of typical background noise levels in the area during the daytime and night-time periods.

The noise levels arising from the facility have been calculated using the computer noise modelling software, CadnaA, using the methodology detailed in ISO9613-2. The predicted noise levels at the identified receptor locations and the baseline survey data have been used to derive the resultant noise impact in accordance with BS4142:2014 +A1:2019.

The assessments have concluded that the facility would have a less than adverse noise impact during the typical and peak operational scenarios. During emergency scenarios, when the flare stack and standby generator are in use the impact may be adverse, though given the infrequency of these events, the impact is considered acceptable. Given the above, this assessment has not recommended any additional noise mitigation measures and has concluded there are no reasons why an appropriate environmental permit cannot be granted.

This report has been prepared by Mr Mark Harrison and peer reviewed by Mr Darren Lafon-Anthony of Enzygo Ltd. Both are considered suitably qualified and experienced in the assessment of noise and vibration to prepare this assessment.

1 Introduction

1.1 Project Introduction

1.1.1 Enzygo Limited (Enzygo) has been commissioned by Japan Environmental Development & Investment UK Ltd (JEDI) to undertake an environmental noise impact assessment to support an application for an environmental permit for an anaerobic digestion (AD) facility on land at Moor Lane, Wincanton, Somerset.

1.1.2 The assessment has been undertaken using baseline noise data and computer modelling to quantify the potential noise impact of the operations in accordance with relevant standards and guidance.

1.1.3 Details of the assessment methodology employed, together with the baseline survey data, assessment and conclusions are presented within this report.

1.1.4 It is reiterated that this report is intended for submission as part of an Environmental Permit application. It is not intended for submission as part of a planning application.

1.2 Site Location

1.2.1 The site is located approximately 500m to the south of Wincanton, south of the A303 in Somerset.

1.2.2 The area surrounding the site is rural in nature, with agricultural land in all directions. Beyond this, the area is described as follows:

- To the north of the site is Moor Lane, which runs broadly northwest/southeast along the site boundary, towards Wincanton. Beyond Moor Lane is Wincanton Sports Ground which includes open air sporting facilities and pitches;
- To the east is the continuation of Moor Lane and the junction with Common Road. Beyond this is open agricultural land;
- To the south are a number of agricultural buildings associated with the adjoining farm complex. It is understood at least one of these buildings is to be converted to residential end use; and,
- To the west are further open fields and beyond this, at approximately 430m, is a water treatment facility, accessed via Moor Lane.

1.2.3 The nearest noise sensitive receptor locations are identified in Table 1-1 below. The dwelling identified as Forget me not Farm (AL02) is a consented, permitted development barn conversion with permission granted in 2015. The implementation of the consent is somewhat complicated however it is included in the assessments as it is a consented use.

Table 1-1: Assessment Locations

Assessment Location	Receptor Identification	Approximate Distance from Site Boundary, m	Approximate OS Co-ordinates	
			Easting	Northing
AL01	Look-At-That Home Farm	315	372225	127175
AL02	Forget me not Farm	40	371985	127307
AL03	Wincanton Sports Ground	69	371786	127588
AL04	Lawrence Dairy Farm	415	371377	127643

1.2.4 An existing public footpath through the farmstead will run to the immediate south of the site boundary, joining Moor Lane in the vicinity of the junction with Common Road. This footpath will be retained.

1.2.5 The sensitive receptors and noise monitoring locations are indicated on Figure 1-1 below.

Figure 1-1: Site Location

Google ©

1.2.6 There are two, relatively new, solar farm developments in the vicinity of the site: Sutor Farm Solar Farm and Higher Hatherleigh Solar Farm at 420m and 620m respectively from the site boundary. In addition, the Wincanton Sewage Treatment facility is approximately 430m to the west. Further to this, the A303, a relatively major A-road through the area, is approximately 480m to the north.

1.2.7 Given the above, the site is already exposed to a number of existing noise generating sources in the area, as well as typical agricultural activities associated with a rural setting.

1.3 Scheme Description

1.3.1 The facility is to be used to break down non-waste feedstocks in an anaerobic process to produce biomethane for use in the local and national gas grid network. The facility will process up to 50,000 tonnes per annum of feedstocks, which are to be sourced locally, with the manure being brought to the site from offsite sources.

1.3.2 The facility is to produce gas for export to the National Grid or for use in an onsite auxiliary biogas boiler.

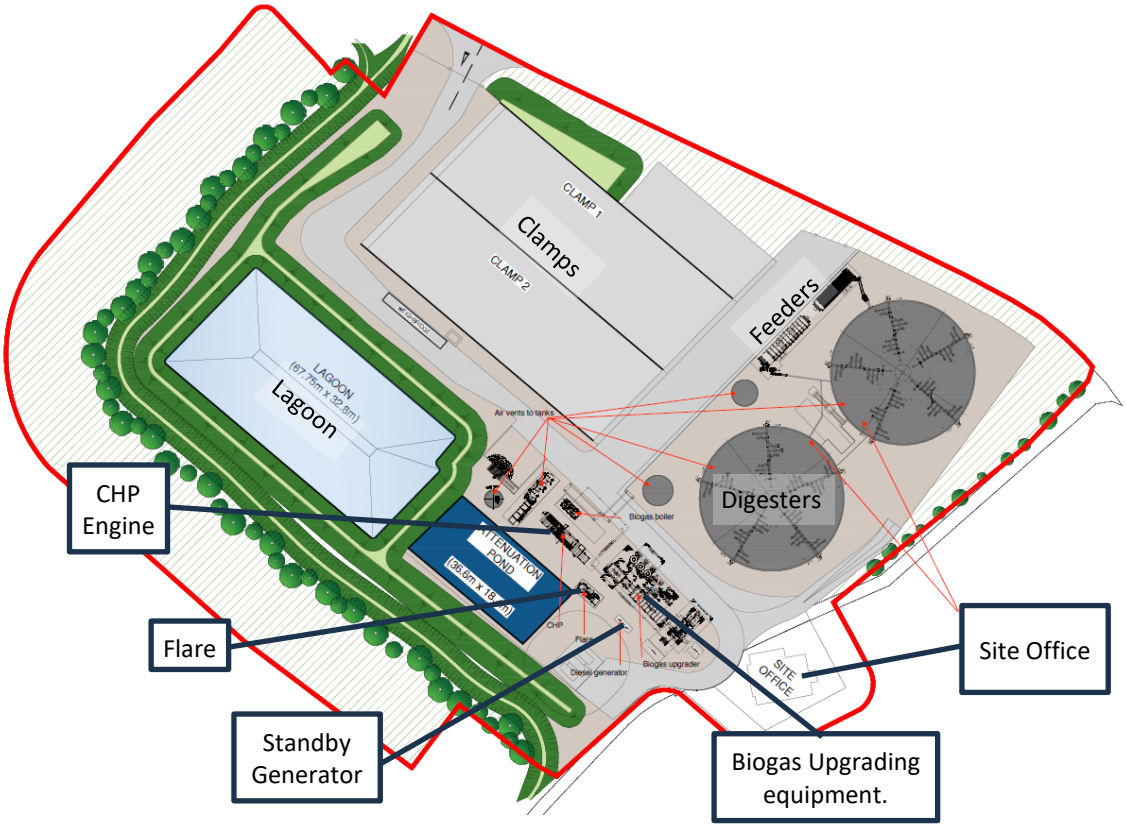
1.3.3 The resultant digestate is used as fertiliser on the farm with some being shipped off site to other farms.

1.3.4 Planning consent for the facility was granted in August 2017 by Somerset County Council under application reference 17/03257/CPO. The application was supported by a noise assessment prepared by Ion Acoustics in report reference A1161 R01A dated July 2017.

1.3.5 The consent included several operational conditions including an operational noise limit for night-time periods (30dB $L_{Aeq,5min}$), and a requirement to maintain a complaint log including a record of actions taken, for the life of the development.

1.3.6 The latest iteration of the site layout is detailed in Figure 1-2 below:

Figure 1-2: SA48969-BRY-ST-PL-A-0005



1.3.7 The facility operates 24/7 although the movement of feedstocks and materials would occur during daytime hours only. The specific hours are detailed below:

Table 1-2: Operational Hours

Operation	Operational Hours
Typical operations	24/7 operations
Vehicle movements and transport activities	Daytime Only
Flare & standby generator operations	Emergency use only

1.3.8 Normal feedstock deliveries will be received at the site during the following operational hours:

- 07:00 to 19:00 hours Monday to Friday;
- 08:00 to 14:00 hours on Saturday;
- 08:00 to 14:00 hours Sunday and Bank Holidays feedstock deliveries are only received during harvest times.

1.3.9 The treatment of feedstock through the process and upgrading of biogas and injection into the grid will in general operate continuously 24 hours a day.

1.4 Inherent mitigation measures

1.4.1 The design of the site is such that it includes several inherent mitigation measures. These include:

- Siting of the facility away from the majority of third-party properties in the area;
- Perimeter bunds and other use of the land form to provide screening; and,
- Vehicle movements made during daytime hours.

1.4.2 These measures are included in this assessment and the noise modelling detailed below.

2 Standards and Guidance

2.1 Introduction

2.1.1 As required by the Environment Agency, the noise assessment has been conducted in accordance with the guidance contained within *British Standard 4142:2014+A1:2019 'Method for rating and assessing industrial and commercial sound'* (BS4142).

2.1.2 Noise levels generated by the proposed development have been predicted to the nearest noise-sensitive receptors, using the calculation methodology outlined in ISO9613:2024 *'Acoustics – Attenuation of sound during propagation outdoors – Part 2: Engineering method for the prediction of sound pressure levels outdoors'* (ISO9613) using the proprietary noise modelling software CadnaA.

2.2 British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound.*

2.2.1 BS4142 provides a methodology for rating and assessing sound associated with both industrial and commercial premises. The purpose of the Standard is clearly outlined in the opening section where it states that the method is appropriate for the consideration of:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and,
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

2.2.2 The Standard is based around the premise that the significance of the noise impact of an industrial/commercial facility can be derived from the numerical subtraction of the background noise level (not necessarily the lowest background level measured, but the typical background of the receptor) from the measured/calculated rating level of the specific sound under consideration. This comparison will enable the impact of the specific sound to be concluded based upon the premise that typically *"the greater this difference, the greater the magnitude of the impact"*. This difference is then considered as follows:

- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5dB is likely to be an indication of an adverse impact, depending upon context; and,
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact.

2.2.3 BS4142 further states that *"where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact"* again depending upon the specific context of the site. The Standard further qualifies the assessment protocol by outlining conditions to the comparative assessment and stating that *"not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact"*, thus implying that all sites should be assessed on their own merits and specifics.

2.2.4 The Standard quantifies the typical reference periods to be used in the assessment of noise, namely:

Typical Daytime	07:00 – 23:00	1-hr assessment period
Typical Night-time	23:00 – 07:00	15-min assessment period

2.2.5 The Standard outlines methods for defining appropriate *"character corrections"* within the rating levels to account for tonal qualities, impulsive qualities, other sound characteristics and/or intermittency. These are a) the Subjective Method, b) the Objective Methods for tonality and c) the Reference Method. It is noted by the Standard that where multiple features are present the corrections should be added in a linear fashion to the specific level.

2.2.6 The Subjective Method is based on the following corrections:

Table 2-1: BS4142 Subjective Method Rating Corrections

Level of Perceptibility	Tonal Correction	Impulsivity Correction	Correction for "Other sound characteristics"	Intermittency Correction
No Perceptibility	+0 dB	+0 dB	Where neither tonal nor Impulsive but clearly identifiable +3 dB	If intermittency is readily identifiable +3 dB
Just Perceptible	+2 dB	+3 dB		
Clearly Perceptible	+4 dB	+6 dB		
Highly Perceptible	+6 dB	+9 dB		

2.3 Environment Agency Method Implementation Document for BS4142

2.3.1 The Method Implementation Document (MID) for BS4142 is the Environment Agency's (EA) guide for the implementation of BS4142 and is applicable when applying for a new, or varying an existing environmental permit through the EA.

2.3.2 The document follows the structure and numbering of BS4142 and provides additional guidance/clarification where the EA feel it is necessary.

2.3.3 With regard qualifying criteria, section 9 of the MID states the following:

'The Environment Agency standard rules permit condition requires operators to prevent noise, and where that is not possible, to minimise it. There is no single level that is acceptable (such as +5dB over background), rather there is a sliding scale of pollution severity that should be as low as is reasonably practicable.'

2.3.4 Section 12 of the MID details the information to be reported and the specifics under each heading. These have been included in this report as far as practical.

2.4 ISO9613 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: Engineering method for the prediction of sound pressure levels outdoors*

2.4.1 The noise levels generated by the operation of the proposed development have been predicted using the calculation methodology set out in ISO9613-2. The methodology considers the distance between the sources and the receptors and applies the amount of attenuation due to atmospheric absorption and other site-specific characteristics.

2.4.2 The methodology assumes downwind propagation, i.e., a wind direction that assists the propagation of noise from the source to all receptors.

3 Baseline Noise Monitoring Survey

3.1 Introduction

3.1.1 Environmental baseline noise surveys were undertaken at the nearest representative locations to the identified noise-sensitive residential receptors, over a period considered sufficient to obtain a representative baseline/background noise climate. The monitoring locations are detailed in Table 3-1 and shown on Figure 1.1.

3.1.2 The monitoring was undertaken between Monday 26th and Wednesday 28th February 2024 to quantify noise levels during the daytime, evening, and night-time periods.

Table 3-1: Noise Monitoring Locations

Monitoring Location	Approx. Distance from Site Boundary, m	Approximate OS Co-ordinates		Justification for Choice of Measurement Location
		Easting	Northing	
M01	290	372211	127154	Representative of the dwellings to the south of the site, in the vicinity of Look-At-That Home Farm
M02	235	371503	127677	Representative of the dwellings to the north including Lawrence Dairy Farm and the Sports Ground

3.2 Weather Conditions

3.2.1 Weather during the set-up period was noted to be cold and dry, with gusty winds. Ambient air temperature was around 8°C though the wind chill was a factor. Cloud cover was around 80%.

3.2.2 Weather conditions during the intervening period are summarised in Table 3-2 below. The data was obtained from publicly available information[1].

Table 3-2: Weather Conditions

Period	Wind Speed & Direction	Rain	Ground Conditions	Cloud Cover	Temperature
26th February 2024	High winds from a northerly direction	N/A	Wet	90%	3°C to 9°C
27th February 2024	Up to 3m/s from north/westerly direction	Shower around 20:00	--	--	0°C to 8°C
28th February 2024	Light breeze SW Direction	N/A	Wet	90%	5°C to 8°C

[1] https://www.wunderground.com/dashboard/pws/IWINCA12/graph/2024-02-27/2024-02-27/daily

3.2.3 During the collection period, the weather was noted to be overcast with light winds and a slight drizzle. Ground conditions were noted to be wet although roads were largely dry. The ambient air temperature was 11°C.

3.2.4 With the periods of rain and high wind excluded, the recorded weather conditions are within appropriate parameters and would have no detrimental effect on the measured survey data.

3.3 Measuring Equipment

3.3.1 The noise monitoring equipment used during the surveys is shown in Table 3-3 and was set to record the $L_{Aeq,T}$, L_{A90}, L_{A10} and L_{Afmax} parameters.

3.3.2 The following set-up parameters were used on the sound level meter during all the noise measurements undertaken:

Time Weighting: Fast

Frequency Weighting: "A"

3.3.3 The sound level meters were field calibrated, using an acoustic calibrator, prior to and upon completion of the overall survey. No significant drift in calibration was noted.

Table 3-3: Noise Monitoring Equipment

Location	Equip. Make & Model	Class	Calibration Level, dB		Serial No.	Calibration Due Date
			Start	End		
M01	Rion NL52 Sound Level Meter	1	94.0	93.9	520990	August 2024
M02	Rion NL52 Sound Level Meter	1	94.0	93.8	721020	November 2024
All	Rion NC-75 Calibrator	--	--	--	34724233	August 2024

3.3.4 The drift in calibration between the start and the end of the surveys is nominal and would have no material impact on the overall assessment outcome.

3.3.5 The external calibration documentation for the equipment used is available upon request.

3.4 Survey Details and Results

3.4.1 The results of the baseline surveys are summarised in Table 3-4 below and can be found in full in Appendix A. The table includes the average, lowest and mode of the measured background noise level. Note that the table excludes periods of adverse weather.

3.4.2 Construction works at the AD site were ongoing during the survey period though were not subjectively considered audible at the monitoring locations. The construction hours during the survey were 06:30 to 20:00 hours Monday, Tuesday, and Wednesday.

3.4.3 Given that the construction works were largely inaudible at the monitoring locations, the above periods have been retained in the summary below.

Table 3-4: Summary of Baseline Survey Results

Location	Duration hh:mm	Period	$L_{Aeq,T}$, dB[1]	L_{Afmax}, dB[2]	Background Noise Level, L_{A90} dB[3]		
					Minimum	Average	Mode
M01	25:15	Day	64.7	97.4	31	42	39
	16:00	Night	50.5	79.8	22	34	35
M02	25:15	Day	57.3	87.4	35	48	49
	16:00	Night	49.8	75.6	26	38	34

1) The logarithmic average of the L_{Aeq} parameter is presented.
2) The maximum recorded L_{Amax} event is reported.
3) The arithmetic average, minimum and mode (most common) background sound level (L_{A90}) are presented.

3.5 Analysis of Background Noise Levels

3.5.1 With reference to the derivation of background noise levels, BS4142 states the following:

'In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods.'

'Among other considerations, diurnal patterns can have a major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes.'

3.5.2 Given the above, and the measured noise levels summarised in Table 3-5, the following 'typical' noise levels have been derived. In the interests of presenting a conservative assessment, the periods measured during the construction hours have been omitted from the analysis below. It is reiterated that no significant construction noise was audible at either monitoring location. However, removal of these periods reduces the potential for the background noise levels to be skewed.

3.5.3 Note the periods of adverse weather have also been omitted from the data set.

Table 3-5: Background Sound Level Analysis

Location	Duration hh:mm	Period	Background Noise Level, L_{A90} dB			'Typical' Background Noise Level, dB
			Minimum	Average	Mode	
M01	05:45	Day	31	38	38	38
	15:00	Night	22	33	35	33
M02	05:45	Day	35	43	42	42
	15:00	Night	26	37	34	34

3.5.4 The 'typical' background noise levels have been derived through consideration of the measured data sets at each location, including analysis of the distribution of $L_{A90,15min}$ values. The distribution charts are presented in Appendix A.

3.6 Existing Context

3.6.1 During the attended portions of the survey, the prevailing noise climate was governed by distant road traffic noise from the north of the site, presumed to be the A303.

3.6.2 Some noise from the construction activities at the AD site was audible at M02 though these were limited to sporadic, low-level bangs and clangs. Some engine type noise was audible from the south of M02 though it could not be determined if this was vehicles on site or on the road.

3.6.3 Other sources of note would be described as general environmental sounds including bird song and light wind noise in nearby trees and hedges.

3.6.4 Overall, the general noise climate would be considered typical of a rural setting. Noise from construction was not considered to be particularly audible nor dominate the prevailing noise climate.

4 Noise Assessment

4.1 Introduction

4.1.1 Specific sound levels generated by the development have been predicted to the identified receptor locations using the calculation methodology outlined in ISO9613.

4.1.2 The resulting predicted specific sound levels have then been assessed in accordance with the guidance contained in BS4142.

4.2 Noise Emissions

4.2.1 The operations at the site centre around the processing of fuel stocks to produce gas for export to the national grid network. The processes involved include a number of noise generating activities and operations including the handling of feedstocks, and gas processing.

4.2.2 The noise sources utilised in the modelling process are detailed below. These are informed by the client and/or typical noise levels for such items.

Table 4-1: Modelled Source Emissions

Plant Noise Source	Number of Units	Noise Level	Notes
Combined Heat and Power Unit (CHP) – Container Envelope	1	62dB @1m	Info provided by Client
Combined Heat and Power Unit (CHP) – Intercooler	1	64dB @1m	
Combined Heat and Power Unit (CHP) – Exhaust Termination	1	69dB @1m	
Standby Diesel Generator	1	83dB @1m	
Biogas Boiler	1	69dB @1m	
Emergency Flare	1	85dB @1m	Library Data
Feed Hopper	2	83dB L_{WA}	
Compressor/CO_2 equipment	1	78dB L_{WA}	
Shovel Loader	1	104dB L_{WA}	
HGV Movements	Discussed Below	106dB L_{WA}	Maximum pass-by noise level used from BS5228 and input to the model as a moving point noise source.

4.2.3 Vehicle movements are modelled as a moving point source, located at a height of 0.5m above local ground level. This is considered reasonable for elements such as drive units (engines), exhausts, etc.

4.2.4 The flare stack and diesel generator are included in the table above as a worst-case scenario. These noise sources would only be used in emergency situations.

4.3 Vehicle Movements

4.3.1 The delivery hours are detailed in Paragraph 1.3.8 above. The vehicle movements to and from the site are derived from averages based on expected tonnages over the delivery hours.

4.3.2 The information indicates around 14no. daily vehicle movements would be expected between November and April consisting primarily of litter and manure deliveries and the export of digestate off site.

4.3.3 Between May and October the number of deliveries increases as harvest crops are delivered to the site. Peak daily movements are understood to be 58no. vehicles in September.

4.3.4 Given the above, it is considered reasonable to assume the following hourly vehicle movements:

- Approximately 1no. vehicle per hour between November and April; and,
- 5no. vehicles per hour during peak harvest periods.

4.3.5 The assessment only considers vehicle movements within the redline boundary.

4.3.6 The loading shovel is considered to work most frequently on the apron area between the clamps and the feeder area, typically loading feed stocks into the hoppers. The loading shovel would not be limited to this area, though in reality, it would not make a significant difference to the predicted noise levels.

4.4 Operating Conditions/Characteristics

4.4.1 Gas production is a 24/7 process, running during both the daytime and night. Vehicle movements are a daytime only activity, operating between the hours detailed above. This arrangement gives three operational scenarios:

- Typical daytime – Gas production and typical vehicle movements;
- Typical night-time – Gas production only; and,
- Peak daytime – Gas production and peak vehicle movements.

4.4.2 In addition to the above, an emergency operational scenario is included to consider the use of the gas flare and standby diesel generator. This is an infrequent operational scenario and only expected to account for up to 10% of the operational hours.

4.5 Noise Modelling

4.5.1 The noise model was constructed using the proprietary noise modelling software package CadnaA. The potential noise impacts at the nearby noise sensitive receptor have been predicted using the calculation methodology outlined in ISO9613-2.

4.5.2 The noise model was constructed using Google Maps geo-referenced 1:1 scaled aerial photography, LIDAR terrain data and site layout plans supplied by the Client. The noise source data used is presented in Table 4-1.

4.5.3 Noise modelling files used in the assessment are appended to this report as a separate data file.

4.5.4 The following assumptions have been made during the modelling process:

- The ground absorption has been set to 1.0 to represent soft ground between the site and receptors; and,
- All equipment has 100% on time when in operation.

4.6 Predicted Sound Levels

4.6.1 Noise levels generated by typical operations at the site have been predicted to the identified receptor locations. Predictions have been made to the ground floor to represent the daytime period and first floor level at night (where appropriate). The assessment locations used in this assessment are detailed in Table 1-1 and Figure 1-1 above. The predicted specific noise levels are presented below.

Table 4-2: Predicted Specific Sound Levels – Typical Operation

Receptor	Assessment Period	Receptor Height, m	Predicted Specific Sound Level, L_s, dB
AL01 – Look-At-That Farm	Daytime	1.5	24.3
	Night-time	4.0	19.2
AL02 – Forget Me Not Farm	Daytime	1.5	34.1
	Night-time	1.5	26.3
AL03 – Wincanton Sports Ground	Daytime	1.5	29.9
AL04 – Lawrence Dairy Farm	Daytime	1.5	19.0
	Night-time	4.0	18.1

4.6.2 Specific noise levels during the peak operational scenario, when more delivery vehicles attend the site, are presented below. This is only considered for daytime hours when the number of delivery vehicles increases. The typical night-time scenario would remain unchanged.

Table 4-3: Predicted Specific Sound Levels – Peak Operation

Receptor	Assessment Period	Receptor Height, m	Predicted Specific Sound Level, L_s, dB
AL01 – Look-At-That Farm	Daytime	1.5	24.7
AL02 – Forget Me Not Farm	Daytime	1.5	34.3
AL03 – Wincanton Sports Ground	Daytime	1.5	31.9
AL04 – Lawrence Dairy Farm	Daytime	1.5	20.1

4.6.3 The predicted specific levels above demonstrate a slight increase over the typical operational assessment, with a maximum increase of 2dB at the sports ground.

4.6.4 Noise levels during the emergency operational scenario are presented below. In this instance, only the night-time period is considered as the impacts would be more acute, given the lower background sound levels.

Table 4-4: Predicted Specific Sound Levels – Emergency Operation

Receptor	Assessment Period	Receptor Height, m	Predicted Specific Sound Level, L_s, dB
AL01 – Look-At-That Farm	Night	4.0	21.4
AL02 – Forget Me Not Farm	Night	1.5	28.1
AL03 – Wincanton Sports Ground	Night	1.5	26.2
AL04 – Lawrence Dairy Farm	Night	4.0	20.6

4.6.5 The predictions above are specific sound levels from the operational site. They do not include rating corrections required for a BS4142 assessment. These are discussed in detail below.

4.7 Derived Sound Rating Levels

4.7.1 The site is in a relatively rural area, largely surrounded by fields and agricultural land with a noise climate dominated by road traffic and general rural/agricultural noises. There are a number of sources of industrial type noise in the area i.e. water treatment facility, solar farms etc however, it is possible that some noise associated with activities at the AD facility could be readily perceptible relative to the existing noise climate.

4.7.2 The activities are not considered to be tonal or intermittent in nature, nor are they particularly impulsive, beyond what would be typical for an agricultural setting.

4.7.3 Given the above, a +3dB character correction for 'other' sound characteristics has been applied when deriving the rating noise level.

4.8 BS4142 Impact Assessment

4.8.1 BS4142 states:

"*The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs.*"

4.8.2 A comparative assessment has been undertaken to determine the potential impact of the predicted sound rating levels at each receptor during the day and night. The typical background noise levels derived in Table 3-5 above have been used in the assessment.

4.8.3 The assessment reflects a worst-case situation when all noise generating activities are operating at typical capacity for 100% of the assessment period.

Table 4-5: BS4142 Assessment – Typical Scenario

Location	Period	Specific Level, dB $L_{As,T}$	Rating Level dB $L_{Ar,T}$	Typical Background Noise Level, dB L_{A90}	Difference, dB
AL01 – Look-At-That Farm	Daytime	24	27	38	-11
	Night	19	22	33	-11
AL02 – Forget Me Not Farm	Daytime	34	37	38	-1
	Night	26	29	33	-4
AL03 – Wincanton Sports Ground	Daytime	30	33	42	-9
AL04 – Lawrence Diary Farm	Daytime	19	22	42	-20
	Night	18	21	34	-13

4.8.4 Table 4-5 above demonstrates that, overall, noise from the AD facility does not exceed the typical background noise levels at the identified receptors. This is considered an indication of a low noise impact in accordance with BS4142.

Table 4-6: BS4142 Assessment – Peak Scenario

Location	Period	Specific Level, dB $L_{s,T}$	Rating Level dB $L_{Ar,T}$	Typical Background Noise Level, dB L_{A90}	Difference, dB
AL01 – Look-At-That Farm	Daytime	25	28	38	-10
AL02 – Forget Me Not Farm	Daytime	34	37	38	-1
AL03 – Wincanton Sports Ground	Daytime	32	35	42	-7
AL04 – Lawrence Dairy Farm	Daytime	20	23	42	-19

4.8.1 The assessments in Table 4-6 indicate that noise from the AD facility, during peak harvest periods would not exceed the background sound level at any receptor location. This would, again, be considered an indication of a low noise impact in accordance with BS4142.

4.8.2 The emergency operational scenario is presented in Table 4-7 below. This scenario assumes all plant is operational for 100% of the assessment period, including the flare stack and the standby generator. It is reiterated that the emergency scenario is only likely to occur for 10% of the operational hours.

Table 4-7: BS4142 Assessment – Emergency Scenario

Location	Period	Specific Level, dB $L_{s,T}$	Rating Level dB $L_{Ar,T}$	Typical Background Noise Level, dB L_{A90}	Difference, dB
AL01 – Look-At-That Farm	Night	21	24	33	-9
AL02 – Forget Me Not Farm	Night	28	31	33	-2
AL04 – Lawrence Dairy Farm	Night	21	24	34	-10

4.8.3 The assessment above demonstrates that during a night-time emergency scenario, noise from the AD facility would fall below the existing background sound level at the identified receptors.

4.9 Context

4.9.1 BS4142 states that where the initial estimate of impact needs to be modified due to the context, all pertinent factors should be taken into consideration.

Sensitivity of the Receptors

4.9.2 Receptors AL01, AL02 and AL04 are residential properties with no links to the proposed development. To that end, they are all considered to be sensitive to potential changes in noise levels arising from the proposals.

4.9.3 Receptor AL03 is the sports ground and, while not considered sensitive to changes in noise levels during the night, would still be sensitive during daytime hours.

The Absolute Level of Sound

4.9.4 The predicted specific sound levels at all receptors are relatively low in absolute terms and are likely to be masked by the existing, prevailing ambient sound levels in the area.

Summary of Context

4.9.5 The context of the setting would not affect the outcome of the impact assessment presented in Tables 4-5 to 4-7 above.

5 Summary of Uncertainty

5.1 Introduction

5.1.1 This report is based upon a range of measurements, a system of calculations and noise predictions. As such, this report attempts to quantify fluctuations in air pressure and is subject to the effects of meteorology, physical and perceived anomalies, tolerances within the measuring and monitoring equipment and accuracy margins within the noise modelling software. In the interests of repeatability, this report must be considered as being affected by common factors involved in the measurement and calculation of noise propagation.

5.1.2 All measurement values, outcomes and assumptions are subject to a margin of uncertainty. This has been quantified and assessed as follows:

- Rounding errors – systemic tolerance of ±1dB;
- Type 1 sound level meter – operational tolerance of ±1.1dB;
- Meteorology – allowance of ±1.9dB; and,
- CadnaA noise propagation modelling software – operational accuracy of ±2.1dB.

5.1.3 The most influential uncertainty factors for the assessment of noise are deemed to be equipment tolerances, meteorology, and software accuracy. A root-sum-square statistical average has been used to provide an overall margin of uncertainty of ±3dB.

5.1.4 It is reiterated that BS4142 states:

'It is not appropriate to numerically estimate the uncertainty and simply make an allowance for this value in any assessment. Instead, an appropriate consideration of uncertainty based on professional judgement can enable an informed decision to be made regarding the likely significance of the impact of sound, whilst considering the range of likely levels and context of the assessment.'

5.1.5 Measures taken to minimise the effect of uncertainty on the predicted noise levels include the following:

- Noise measurements undertaken at a range of locations in the vicinity of the site, as close as practical to the nearest noise-sensitive receptors (where access allows). Measurements undertaken over a number of consecutive days, during both the daytime and night-time periods with consideration of appropriate survey methodologies and techniques to minimise extraneous or unrepresentative survey data;
- Calculations undertaken in accordance with ISO9613-2 utilising reasonable assumptions and professional judgement to minimise uncertainty, i.e., assumed 100% operation etc;
- Detailed analysis of the prevailing background noise level to derive 'typical' background noise levels at the receptors. This includes the omission of periods of adverse weather and other potential events which may skew the data set; and,
- Careful consideration of character corrections used in the derivation of the rating sound levels.

5.1.6 Given the above, it is concluded that uncertainty would not significantly affect the assessment outcomes.

6 Conclusion

6.1 Background

6.1.1 Enzygo Limited has been commissioned by Japan Environmental Development & Investment UK Ltd to undertake a noise impact assessment to support an environmental permit application for their Anaerobic Digestion facility on land at Moor Lane, Wincanton, Somerset.

6.1.2 The assessment has been undertaken to assess the potential noise impact associated with operation of the facility to use agricultural feedstocks and other byproducts to produce gas for export to the national grid network.

6.1.3 The assessment is based on the results of a series of noise predictions undertaken in accordance with the calculation methodology contained in ISO9613 *'Acoustics – Attenuation of sound during propagation outdoors – Part 2: Engineering method for the prediction of sound pressure levels outdoors'* and the results of baseline noise surveys undertaken at locations representative of the nearest noise-sensitive receptors.

6.2 Noise Assessment

6.2.1 Sound levels generated by the operational site have been predicted using the proprietary noise modelling software CadnaA. An assessment has been made in accordance with the guidance contained in BS4142:2014 +A1:2019.

6.2.2 During typical operations, the noise impact arising from operations at the facility are considered low in accordance with BS4142.

6.2.3 The impact during the peak operational period, when there are increased vehicle movements during harvest periods, is again considered low.

6.2.4 During the emergency operational period, when both the flare and standby generator are in operation, the noise impact is considered low.

6.2.5 Given the above, it is concluded that noise from the facility would result in no sustained adverse noise impacts on any of the receptors in the vicinity of the development. As such, there are no reasons, on noise grounds, why the environmental permit cannot be granted.

Glossary of Terminology

Noise is defined as unwanted sound. The range of audible sound is known to be from 0dB (threshold of hearing) to 140dB (threshold of pain). Examples of typical noise levels relating to 'everyday' occurrences are given in Table G-1 below.

Table G-1: Typical Noise Levels

Source	Sound Pressure Level in dB(A)	Subjective Level
Gun shot	160	Perforation of eardrum
Military Jet take-off	140	Threshold of pain
Jet Aircraft at 100m	120	Very Loud
Rock Concert, front seats	110	Threshold of Sensation
Pneumatic Drill at 5m	100	Very Loud
Heavy goods vehicle from pavement	90	
Traffic at kerb edge	70 – 85	Loud
Vacuum Cleaner, Hair Dryer	70	
Normal conversation at 1m	60	Moderate
Typical Office	50 – 60	
Residential area at night	40	Quiet
Rural area at night, still air	30	
Leaves Rustling	20	
Rubbing together of fingertips	10	
	0	Threshold of hearing

The frequency response of the human ear to noise is usually taken to be around 18Hz (number of oscillations per second) to 18,000Hz. However, the human ear does not respond equally to different frequencies at the same level; it is more sensitive in the mid-frequency range than lower and higher frequencies and, because of this, when undertaking the measurement of noise the low and high frequency components of any given sound are reduced in importance by applying a filtering (weighting) circuit to the noise measuring instrument. The weighting which is widely accepted to correlate best with the subjective nature of human response to noise and is most widely used to quantify this is the A-weighted filter set. This is an internationally accepted standard for noise measurement.

For variable noise sources within an area an increase of 3dB(A) would be the minimum perceptible to the human ear under normal conditions. It is generally accepted that an increase/decrease of 10dB(A) corresponds to a doubling or halving in perceived loudness. The 'loudness' of a noise is a purely subjective parameter, dependant not only upon the sound pressure of the event but also on the dynamics of the listener's ear, the time of the day and the general mood of the person.

With regard to environmental noise levels (in the open air), these are rarely steady but rise and fall according to the activities being undertaken within the surrounding area at any given time. In an attempt to produce a figure that relates this variable nature of noise to human subjective response, a number of statistical noise metrics have been developed. These and other useful terminology and descriptors are presented in Table G-2 below.

Table G-2: Terminology

Term	Definition
Sound	Pressure fluctuations in a fluid medium within the audible range of amplitudes and frequencies which stimulate the organs of hearing.
Noise	Unwanted sound emitted from a source and received by the sensitive receptor.
Decibel (dB)	Unit most often used to describe the sound pressure level. A logarithmic number, it correlates closely to the way in which humans perceive sound. Its wide range of values helps quantify sound pressures from a large variety of magnitudes.
A-Weighting (dB(A))	Human perception of sound is frequency dependant. A-weighting applies a range of corrections at each frequency to provide a 'human-averaged'. Can be frequency band or broadband values.
Frequency (Hz)	The number of cycles per second, for sound this is closely related (and often mistaken for) pitch.
Frequency Spectrum	A more detailed analysis of the frequency components that comprise a sound source.
$L_{A10,T}$	The 10th statistical percentile of a measurement period, i.e. the level that is exceeded for 10% of the measurement duration. Closely correlates with traffic sources, A-weighted.
$L_{A90,T}$	The 90th statistical percentile of a measurement period, i.e. the level that is exceeded for 90% of the measurement duration. Used to describe background sound levels, as this value is affected less by short, transient sound sources, A-weighted.
L_{Amax}	The root mean square (RMS) maximum sound pressure level within a measurement period, A-weighted.
Ambient Sound	The total sound climate of all sources incident at one location, both in the near- and far-field (*The ambient sound comprises the residual sound and the specific sound when present)*.
Ambient Sound Level $L_a = L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
Background Sound Level $L_{A90,T}$	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
Equivalent Continuous A-weighted Sound Pressure Level $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation:

Term	Definition
	$$L_{Aeq,T} = 10lg_{10}\left\{\left(\frac{1}{T}\right)\int_{t1}^{t2}\left[p_A\frac{(t)^2}{{p_0}^2}\right]dt\right\}$$ Where p_0 is the reference sound pressure (20µPA); and $P_A(t)$ is the instantaneous A-weighted sound pressure level at time t.
Measurement Time Interval T_m	Total time over which measurements are taken (*This may consist of the sum of a number of non-contiguous, short-term measurement time intervals)*
Rating level $L_{Ar,Tr}$	Specific sound level plus any adjustment for the characteristic features of the sound, over a period of time, T.
Reference Time Interval, T_r	Specified interval over which the specific sound level is determined (This is 1hr during the day from 07:00 to 23:00 hours and a shorter period of 15-min at night from 23:00 to 07:00 hours).
Residual Sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Residual sound level $L_r = L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the residual sound in a given situation at the assessment location over a given time interval, T.
Sound Pressure Level	The level of fluctuation in air pressure, caused by airborne sound sources. Measured in Pascals (Pa).
Sound Power Level	The rate at which sound is radiated by a source. This parameter is useful as it describes sound energy before environmental or decay factors. Quantified in dB and notated usually as L_w or SWL.
Specific sound level $L_s = L_{Aeq,Tr}$	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given time interval, T.
Specific Sound Source	Sound source being assessed.

Statement of Competency

The assessment has been undertaken by Mr Mark Harrison, Principal Acoustic Consultant at Enzygo Limited. Mr Harrison holds a Batchelor of Science degree in Music Technology and a post graduate Diploma in Acoustics and Noise Control.

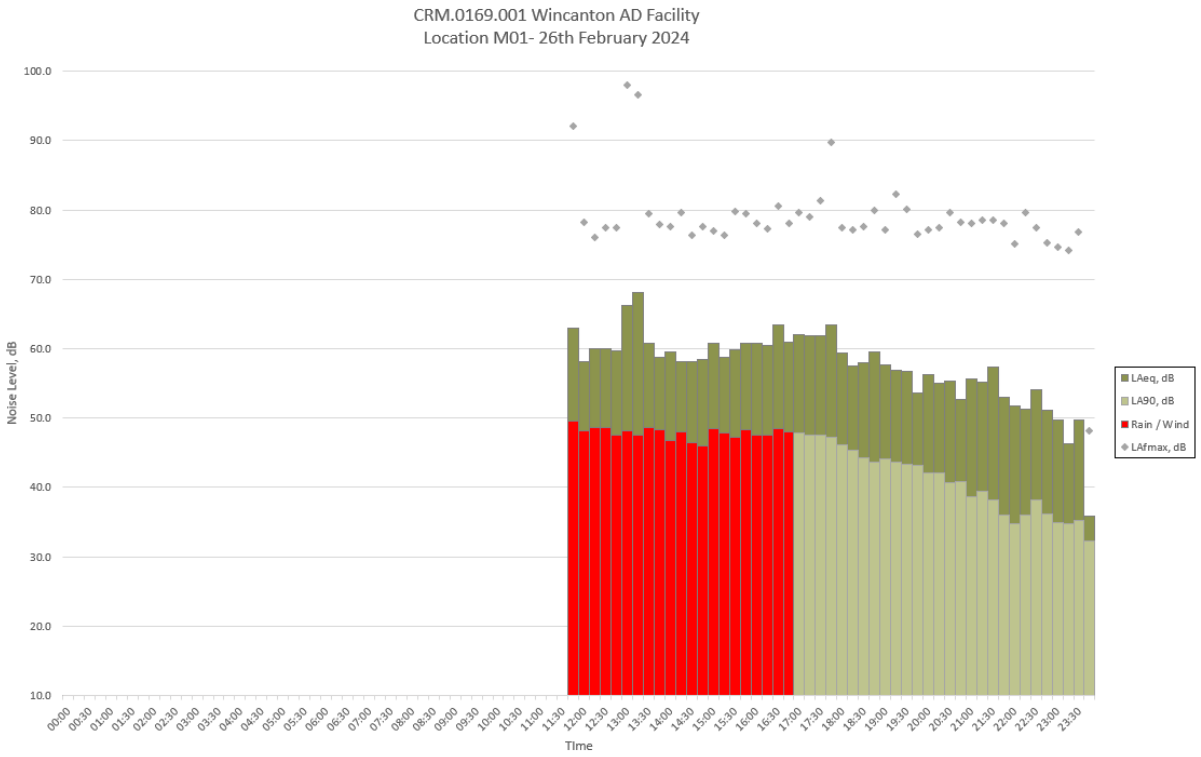
Mr Harrison has worked in acoustic consultancy since 2007 and has worked on noise and vibration assessments in several sectors including industrial / commercial developments; power generation and distribution; residential developments; transport schemes; and mineral extraction and processing.

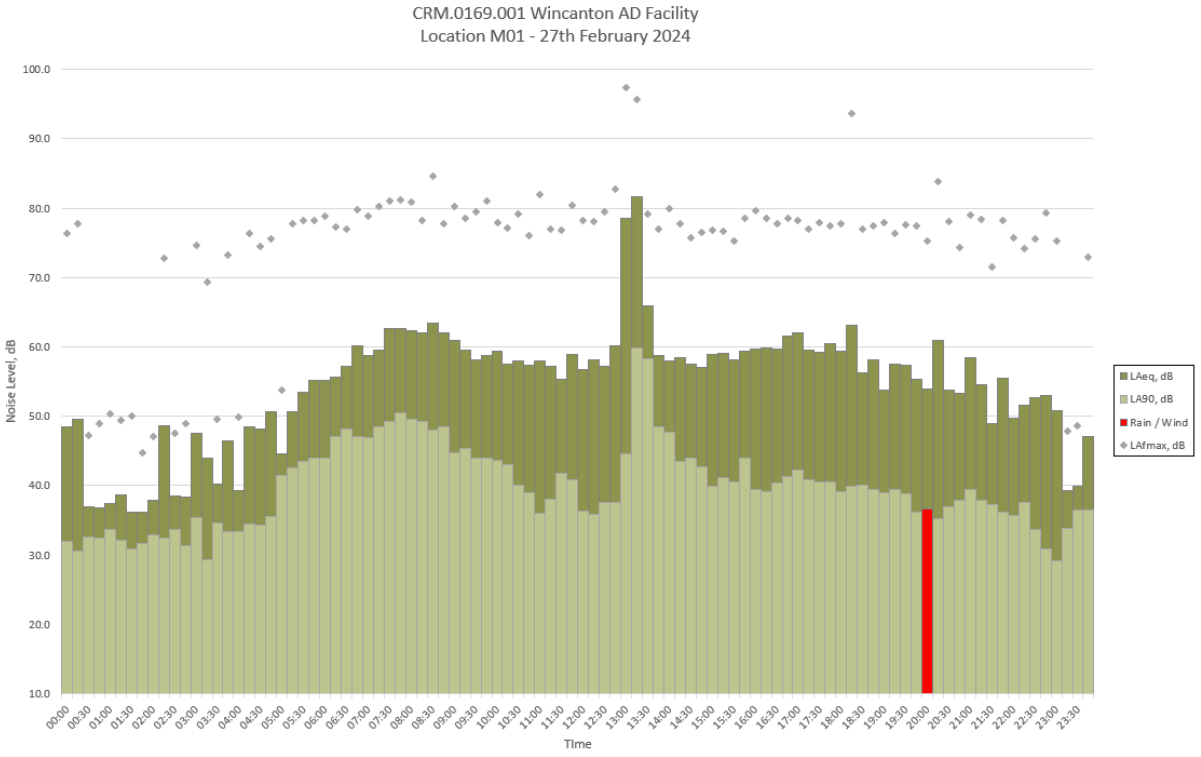
The report has been prepared under the supervision of Mr. Darren Lafon-Anthony who is the Director of Acoustics at Enzygo Limited. Mr. Lafon-Anthony holds a Master of Science Degree in Applied Acoustics and has been a Corporate Member of the Institute of Acoustics since July 2004 having previously been an Associate Member of the institute since October 2001. Mr. Lafon-Anthony is also a Fellow of the Institute of Quarrying based on his contribution to minerals and mining noise assessment and mitigation, a qualification he has held since September 2014.

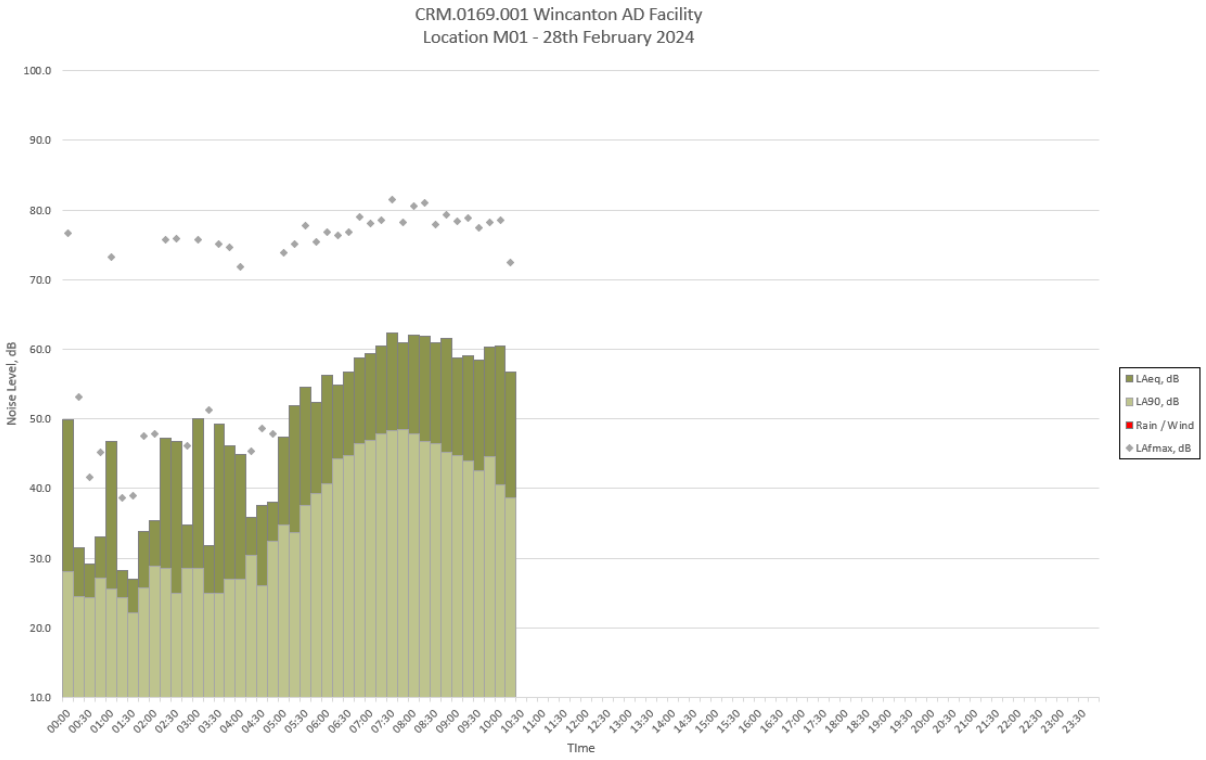
Mr. Lafon-Anthony has worked in acoustics since January 1981. Initially as an engineer designing and overseeing manufacture of noise control equipment for the water industry, standby power diesel generator and power generation markets for several noise control equipment manufacturers and, since February 2004, as an environmental noise consultant in various sectors, including mineral and mining sites, waste disposal and recycling sites, large industrial developments, energy supply projects (EfW, STOR and Battery Energy sites) and residential developments in the UK, Europe and sub-Saharan Africa.

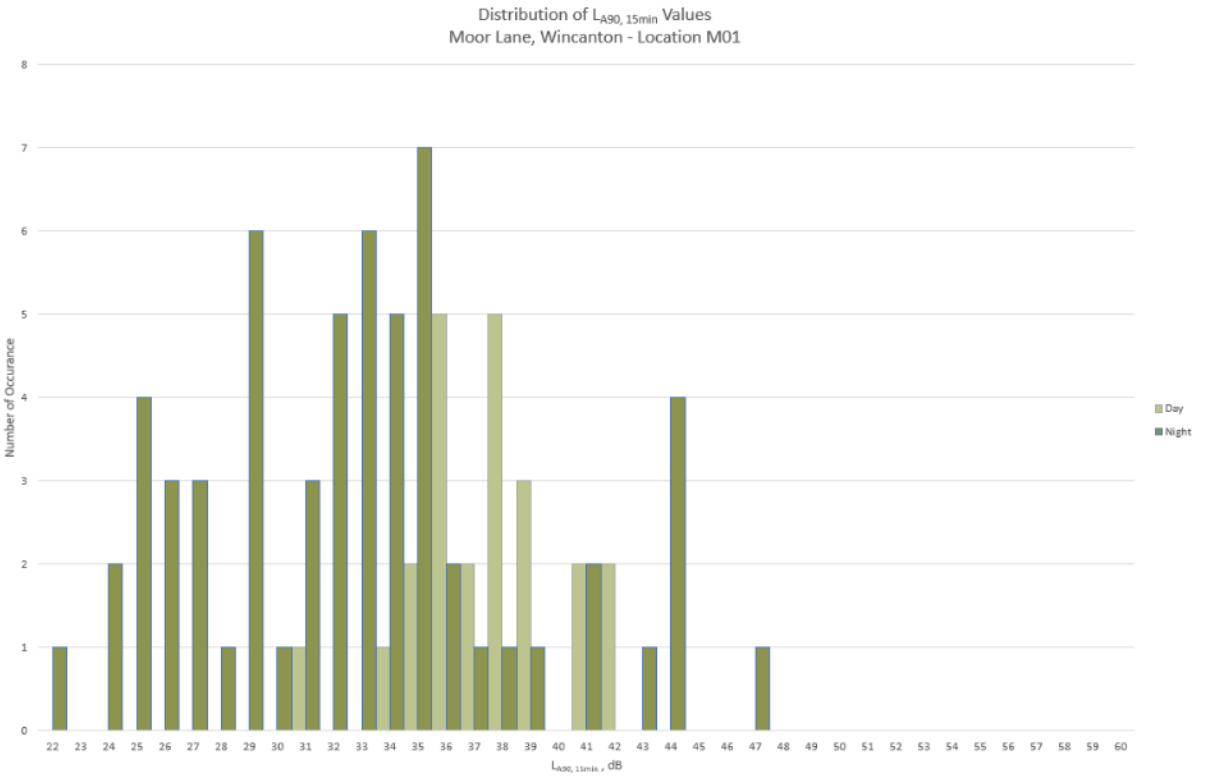
APPENDIX A – Survey Data

Location M01 Data






CRM.0169.001 Wincanton AD Facility
Location M01 - 28th February 2024
Noise Level, dB
Time
LAeq, dB
LA90, dB
Rain / Wind
LAfmax, dB


Distribution of LA90, 15min Values
Moor Lane, Wincanton - Location M01
Number of Occurance
LA90, 15min , dB
Day
Night

Period Start	L_{Aeq}, dB	L_{Afmax}, dB	L_{A10}, dB	L_{A90}, dB	Period Start	L_{Aeq}, dB	L_{Afmax}, dB	L_{A10}, dB	L_{A90}, dB	Period Start	L_{Aeq}, dB	L_{Afmax}, dB	L_{A10}, dB	L_{A90}, dB
26/02/2024 11:45	63.0	92.1	57.4	49.5	27/02/2024 03:30	40.2	49.6	43.2	34.6	27/02/2024 19:15	57.5	76.3	58.7	39.4
26/02/2024 12:00	58.1	78.3	54.8	48.2	27/02/2024 03:45	46.4	73.2	45.0	33.4	27/02/2024 19:30	57.4	77.6	58.1	38.8
26/02/2024 12:15	60.0	76.0	62.5	48.6	27/02/2024 04:00	39.3	49.8	42.8	33.3	27/02/2024 19:45	55.4	77.4	53.9	36.2
26/02/2024 12:30	60.0	77.4	61.2	48.7	27/02/2024 04:15	48.4	76.4	43.0	34.5	27/02/2024 20:00	54.0	75.3	49.6	36.7
26/02/2024 12:45	59.7	77.5	60.9	47.5	27/02/2024 04:30	48.2	74.5	42.5	34.3	27/02/2024 20:15	60.9	83.9	58.5	35.2
26/02/2024 13:00	66.3	98.0	61.6	48.1	27/02/2024 04:45	50.6	75.5	41.6	35.5	27/02/2024 20:30	53.8	78.0	43.0	37.0
26/02/2024 13:15	68.1	96.6	56.2	47.6	27/02/2024 05:00	44.5	53.7	46.9	41.4	27/02/2024 20:45	53.3	74.4	50.9	37.9
26/02/2024 13:30	60.8	79.4	60.1	48.6	27/02/2024 05:15	50.6	77.7	49.2	42.6	27/02/2024 21:00	58.5	79.0	54.4	39.4
26/02/2024 13:45	58.8	77.9	58.2	48.3	27/02/2024 05:30	53.4	78.3	49.3	43.5	27/02/2024 21:15	54.6	78.4	47.1	37.9
26/02/2024 14:00	59.5	77.6	59.2	46.7	27/02/2024 05:45	55.2	78.3	49.4	43.9	27/02/2024 21:30	49.0	71.5	46.5	37.3
26/02/2024 14:15	58.2	79.7	57.9	48.0	27/02/2024 06:00	55.2	78.8	52.4	44.0	27/02/2024 21:45	55.5	78.3	53.4	36.1
26/02/2024 14:30	58.2	76.4	58.4	46.4	27/02/2024 06:15	55.6	77.3	53.2	47.0	27/02/2024 22:00	49.7	75.7	42.0	35.7
26/02/2024 14:45	58.4	77.6	56.8	46.0	27/02/2024 06:30	57.2	77.0	55.6	48.2	27/02/2024 22:15	51.6	74.2	51.4	37.6
26/02/2024 15:00	60.8	77.0	63.2	48.5	27/02/2024 06:45	60.2	79.8	58.6	47.0	27/02/2024 22:30	52.7	75.6	52.6	33.6
26/02/2024 15:15	58.8	76.4	58.4	47.8	27/02/2024 07:00	58.7	78.9	55.9	46.9	27/02/2024 22:45	53.0	79.3	47.6	30.8
26/02/2024 15:30	59.9	79.8	61.1	47.3	27/02/2024 07:15	59.5	80.3	59.1	48.4	27/02/2024 23:00	50.8	75.3	41.3	29.2
26/02/2024 15:45	60.7	79.4	61.3	48.3	27/02/2024 07:30	62.6	81.0	64.6	49.3	27/02/2024 23:15	39.3	47.9	41.9	33.9
26/02/2024 16:00	60.8	78.1	62.8	47.5	27/02/2024 07:45	62.7	81.2	64.2	50.5	27/02/2024 23:30	39.9	48.7	42.2	36.5
26/02/2024 16:15	60.4	77.3	62.1	47.5	27/02/2024 08:00	62.4	80.8	63.6	49.6	27/02/2024 23:45	47.0	73.0	44.2	36.4
26/02/2024 16:30	63.5	80.5	67.6	48.5	27/02/2024 08:15	62.0	78.3	63.8	49.2	28/02/2024 00:00	49.9	76.6	42.3	28.0
26/02/2024 16:45	61.0	78.0	62.9	48.0	27/02/2024 08:30	63.5	84.6	64.7	48.0	28/02/2024 00:15	31.5	53.2	34.1	24.5
26/02/2024 17:00	62.0	79.7	64.6	47.8	27/02/2024 08:45	62.1	77.8	64.6	48.4	28/02/2024 00:30	29.2	41.6	32.7	24.3
26/02/2024 17:15	61.8	79.0	64.4	47.6	27/02/2024 09:00	60.9	80.3	59.4	44.8	28/02/2024 00:45	33.1	45.2	36.6	27.2
26/02/2024 17:30	61.8	81.3	63.5	47.5	27/02/2024 09:15	59.6	78.5	59.7	45.3	28/02/2024 01:00	46.8	73.3	34.4	25.5
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26/02/2024 18:45	59.5	79.9	59.2	43.7	27/02/2024 10:30	57.9	79.1	55.1	40.1	28/02/2024 02:15	47.2	75.8	39.8	28.6
26/02/2024 19:00	57.6	77.2	56.1	44.1	27/02/2024 10:45	57.3	76.1	54.9	38.9	28/02/2024 02:30	46.8	75.9	38.7	24.9
26/02/2024 19:15	56.9	82.2	49.9	43.6	27/02/2024 11:00	58.0	82.0	55.3	36.0	28/02/2024 02:45	34.8	46.1	37.9	28.5
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26/02/2024 19:45	53.6	76.5	47.9	43.1	27/02/2024 11:30	55.3	76.8	54.0	41.8	28/02/2024 03:15	31.8	51.2	34.5	24.9
26/02/2024 20:00	56.2	77.2	51.6	42.1	27/02/2024 11:45	58.9	80.4	57.8	40.8	28/02/2024 03:30	49.2	75.1	36.9	25.0
26/02/2024 20:15	55.0	77.4	48.9	42.1	27/02/2024 12:00	56.7	78.3	49.9	36.3	28/02/2024 03:45	46.2	74.7	36.8	27.0
26/02/2024 20:30	55.4	79.7	48.2	40.7	27/02/2024 12:15	58.2	78.0	57.3	35.9	28/02/2024 04:00	44.9	71.9	36.2	26.9
26/02/2024 20:45	52.7	78.3	46.0	40.9	27/02/2024 12:30	57.2	79.4	55.6	37.5	28/02/2024 04:15	35.9	45.3	38.8	30.4
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26/02/2024 23:15	46.3	74.2	40.5	34.8	27/02/2024 15:00	58.9	76.8	59.0	39.9	28/02/2024 06:45	58.8	79.0	57.5	46.5
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27/02/2024 00:30	36.9	47.2	39.7	32.6	27/02/2024 16:15	59.8	78.6	61.3	39.1	28/02/2024 08:00	62.1	80.5	64.8	47.8
27/02/2024 00:45	36.8	48.9	39.7	32.5	27/02/2024 16:30	59.7	77.7	61.3	40.4	28/02/2024 08:15	61.9	81.1	64.0	46.8
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27/02/2024 01:30	36.1	50.1	39.1	30.8	27/02/2024 17:15	59.5	77.0	59.8	40.9	28/02/2024 09:00	58.7	78.4	58.3	44.7
27/02/2024 01:45	36.1	44.7	38.7	31.7	27/02/2024 17:30	59.2	77.9	59.7	40.5	28/02/2024 09:15	59.1	78.8	60.2	43.9
27/02/2024 02:00	37.9	47.1	40.7	32.9	27/02/2024 17:45	60.5	77.4	63.3	40.6	28/02/2024 09:30	58.4	77.4	59.4	42.6
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27/02/2024 02:45	38.3	48.9	41.6	31.4	27/02/2024 18:30	56.3	77.0	53.2	40.0	28/02/2024 10:15	56.7	72.4	59.5	38.6
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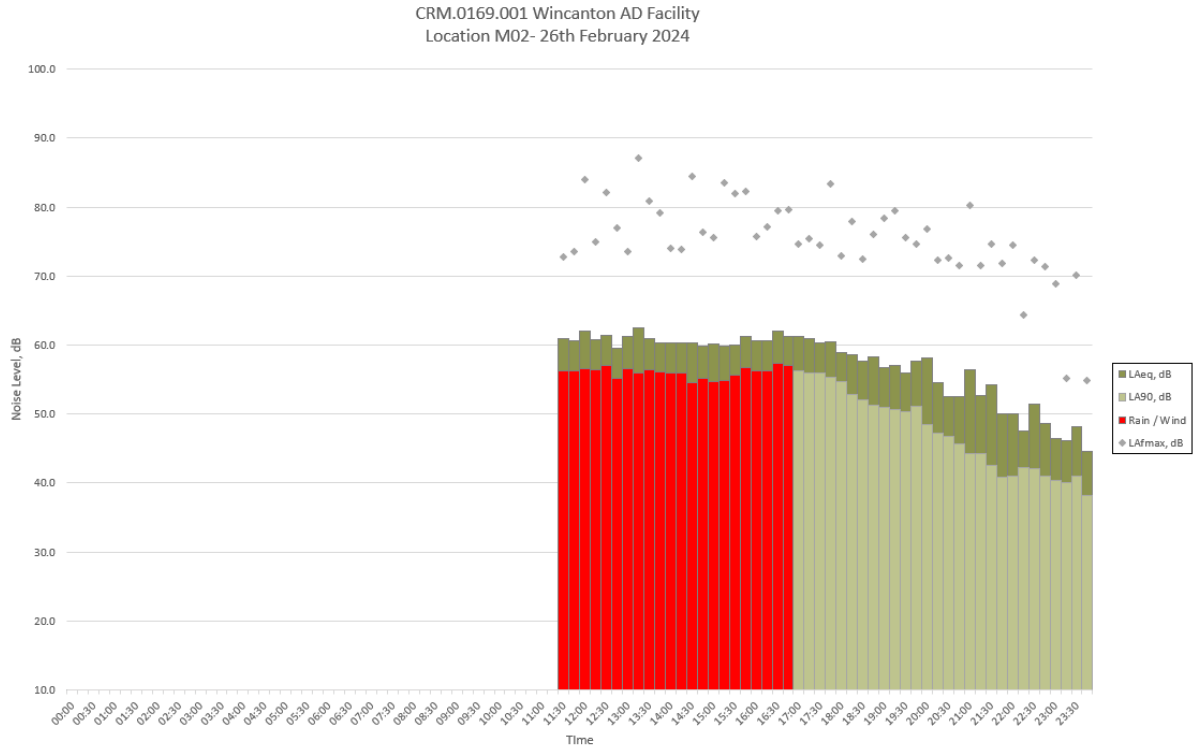

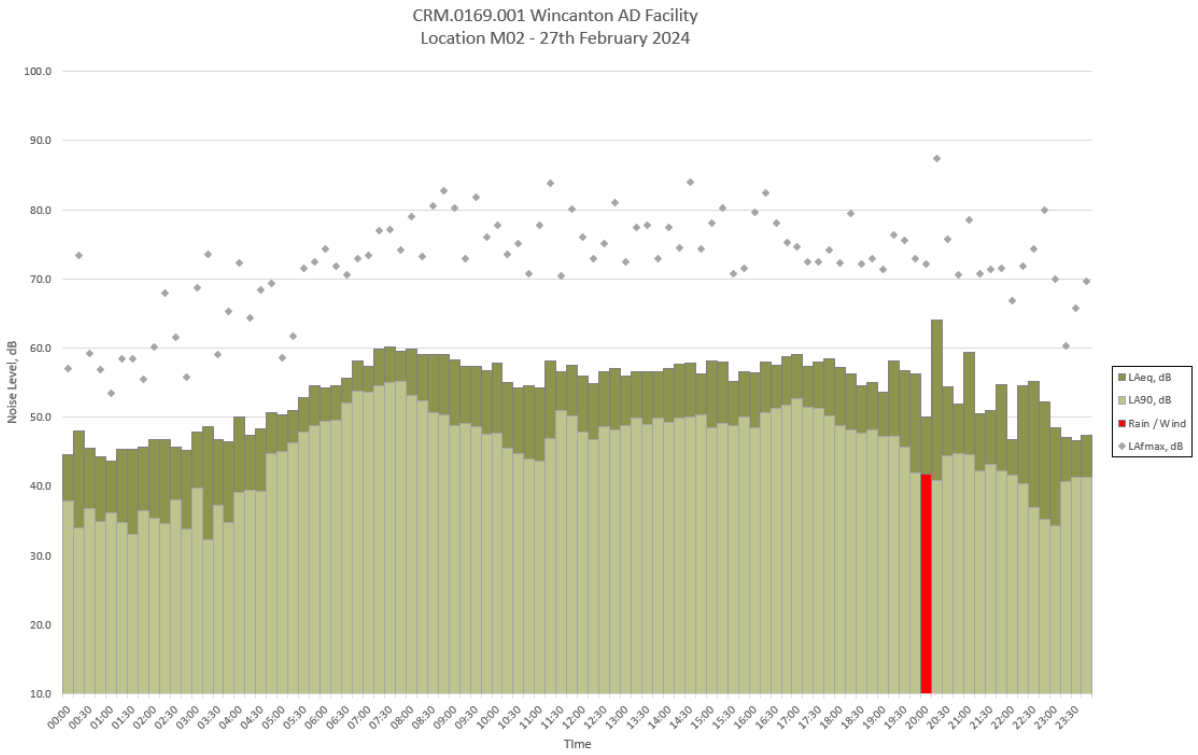

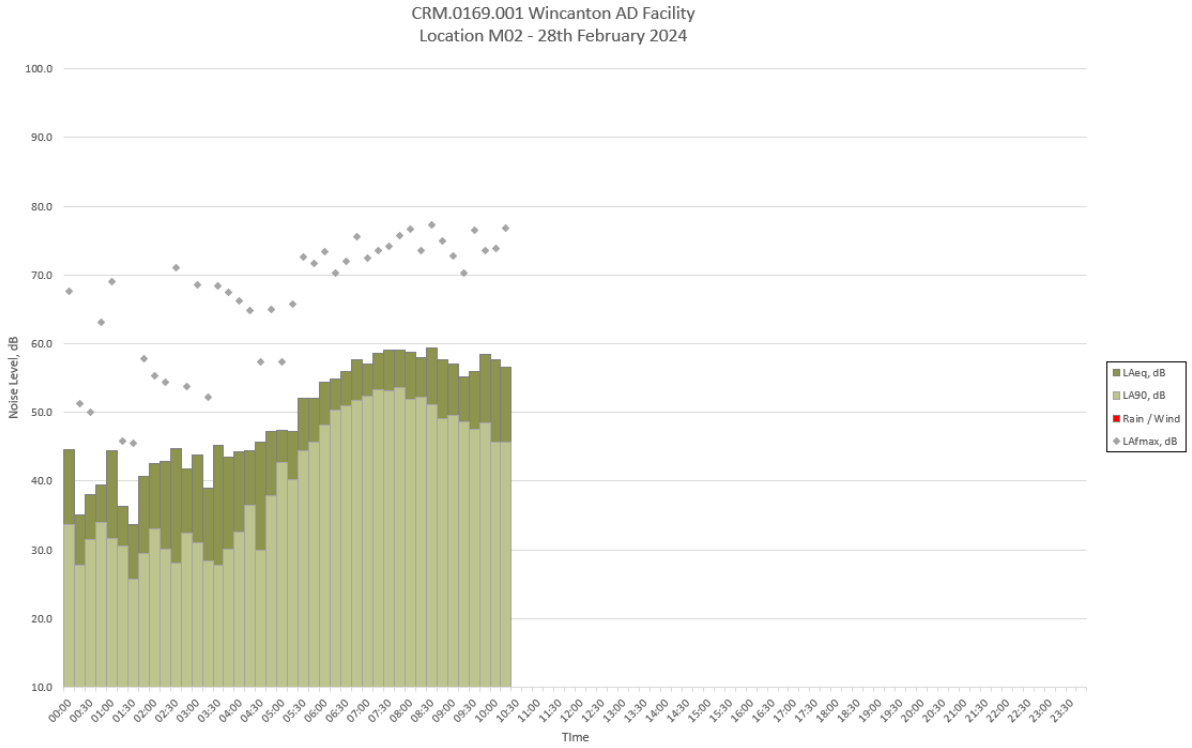
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Time
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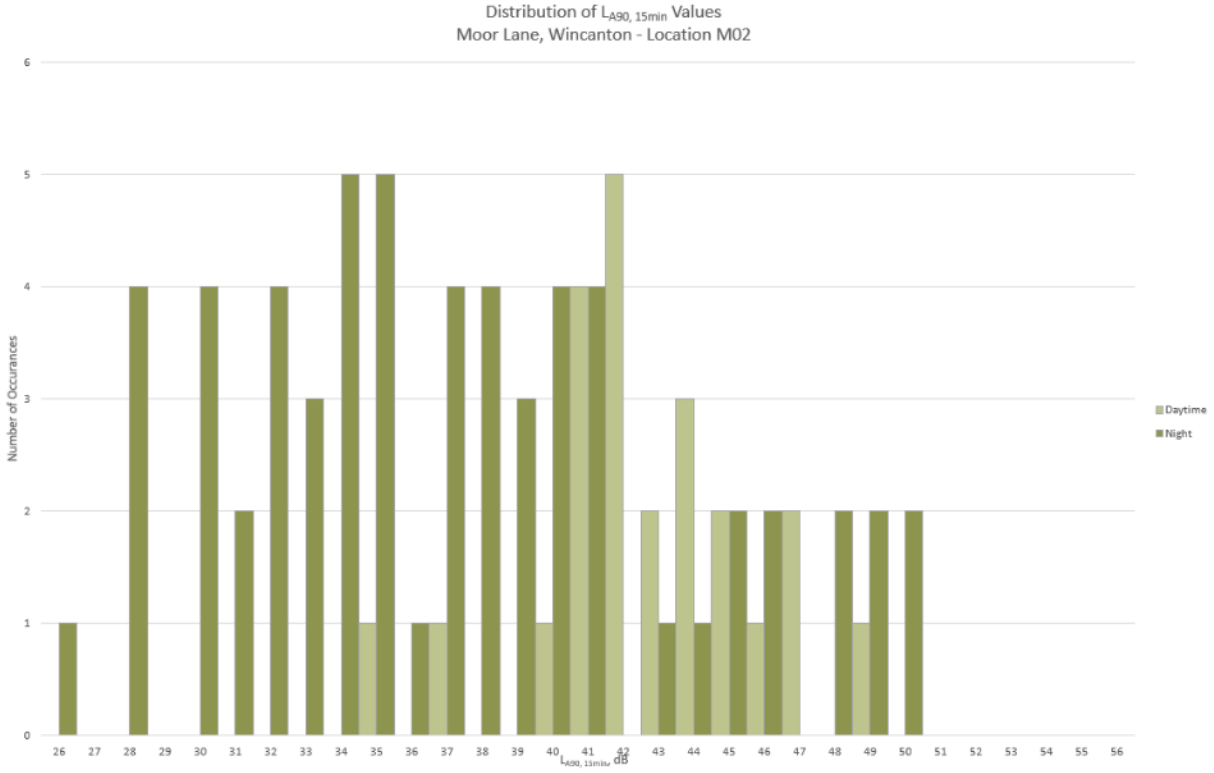
LA90, dB
Rain / Wind
LAfmax, dB


Distribution of LA90, 15min Values
Moor Lane, Wincanton - Location M02
Number of Occurances
LA90, 15min dB
Daytime
Night

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26/02/2024 11:45	60.6	73.6	62.4	56.2	27/02/2024 03:30	46.8	59.1	50.4	37.3	27/02/2024 19:15	58.1	76.3	61.8	47.3
26/02/2024 12:00	62.1	84.0	63.6	56.6	27/02/2024 03:45	46.5	65.3	49.8	34.7	27/02/2024 19:30	56.7	75.5	59.0	45.7
26/02/2024 12:15	60.8	75.0	63.2	56.4	27/02/2024 04:00	50.1	72.3	51.8	39.2	27/02/2024 19:45	56.3	72.9	56.7	42.0
26/02/2024 12:30	61.4	82.1	62.5	57.0	27/02/2024 04:15	47.4	64.3	50.3	39.4	27/02/2024 20:00	50.1	72.2	48.9	41.8
26/02/2024 12:45	59.6	77.0	61.2	55.1	27/02/2024 04:30	48.3	68.4	51.1	39.3	27/02/2024 20:15	64.1	87.4	57.1	40.9
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26/02/2024 13:15	62.5	87.1	61.5	56.0	27/02/2024 05:00	50.3	58.6	53.2	45.1	27/02/2024 20:45	51.9	70.6	53.3	44.7
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26/02/2024 14:15	60.3	73.9	62.1	56.0	27/02/2024 06:00	54.2	74.4	55.1	49.4	27/02/2024 21:45	54.7	71.6	56.1	42.3
26/02/2024 14:30	60.3	84.4	61.4	54.5	27/02/2024 06:15	54.5	71.9	55.6	49.6	27/02/2024 22:00	46.8	66.9	48.5	41.6
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26/02/2024 16:00	60.6	75.8	62.8	56.2	27/02/2024 07:45	59.6	74.2	61.1	55.2	27/02/2024 23:30	46.6	65.7	49.2	41.3
26/02/2024 16:15	60.6	77.2	62.9	56.2	27/02/2024 08:00	59.8	79.0	61.5	53.1	27/02/2024 23:45	47.4	69.7	49.2	41.3
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26/02/2024 18:30	57.7	72.4	60.1	52.0	27/02/2024 10:15	55.0	73.5	56.7	45.5	28/02/2024 02:00	42.6	55.4	46.4	33.1
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26/02/2024 19:45	57.6	74.6	59.6	51.1	27/02/2024 11:30	56.5	70.4	58.2	50.9	28/02/2024 03:15	38.9	52.2	42.9	28.4
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27/02/2024 02:45	45.2	55.8	49.5	33.9	27/02/2024 18:30	54.5	72.2	55.2	47.7	28/02/2024 10:15	56.5	76.9	57.5	45.6
27/02/2024 03:00	47.8	68.8	50.1	39.8	27/02/2024 18:45	55.0	72.9	55.1	48.2	28/02/2024 10:30	0.0	0.0	0.0	0.0

APPENDIX B – Noise Contour Plots

Figure B-1: Noise Contour Plot (L_{Aeq}) – Typical Daytime (1.5m)

Figure B-2: Noise Contour Plot (L_{Aeq}) – Typical Night (4m)

Figure B-3: Noise Contour Plot (L_{Aeq}) – Peak Daytime (1.5m)

Figure B-4: Noise Contour Plot (L_{Aeq}) – Emergency Night (4m)

Enzygo specialise in a wide range of technical services:

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Appendix D – Air Quality Assessment

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environmental consultants

Air Quality Impact Assessment

Brains Farm, Wincanton, Anaerobic Digestion Plant

Japan Environmental Development & Investment UK Limited

CRM.0169.001.AQ.R.001

'Experience and expertise working in union'

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Air Quality Assessment - CRM.0169.001.AQ.R.001

Project:	Brains Farm, Wincanton, Anaerobic Digestion Plant
For:	Japan Environmental Development & Investment UK Limited
Status:	Final
Date:	March 2024
Author:	Josh Davies BSc (Hons) – Principal Air Quality Consultant
Reviewer:	Conal Kearney BEng (Hons) MSc MIAQM MIEnvSc – Director of Air Quality

Contents

1.0 Introduction 2
1.1 Background 2
1.2 Site Location and Context 2
1.3 Facility Operations 3
2.0 Legislation, Guidance and Environmental Standards 5
2.1 Guidance 5
2.2 Environmental Quality Standards 5
2.3 Ecological Critical Levels 6
3.0 Dispersion Modelling Inputs 7
3.1 Emission Sources 7
3.2 Dispersion Modelling 7
3.3 Modelling Scenarios and Emissions 8
3.4 Time Varied Emissions 1
3.5 Terrain Data 1
3.6 Building Effects 1
3.7 Meteorological Data 2
3.8 NO_x to NO_2 Conversion 3
3.9 15-minute Sulphur Dioxide Concentration Predictions 4
4.0 Baseline and Sensitive Receptors 5
4.1 Human Receptors 5
4.2 Ecological Sensitive Receptors 7
4.3 Assessment Criteria and Significance of Impacts 9
4.4 Modelling Uncertainties 10
4.5 Assumptions 11
4.6 Dispersion Modelling Report Requirements 11
5.0 Results 13
5.1 Introduction 13

5.2 Human Receptors 13

5.3 Ecological Receptors 19

6.0 Conclusions 21

7.0 Abbreviations 22

Tables and Figures

Figure 1: Site Surrounding 2

Table 1: Proposed Feedstocks and Annual Throughputs 3

Table 2: Environmental Quality Standards for Human Exposure 5

Table 3: Where EQS Apply 6

Table 4: Critical Levels for the Protection of Vegetation 6

Table 5: Stack Locations 7

Figure 2: ADMS-6 Modelling Inputs 8

Table 6: Dispersion Modelling Scenarios 8

Table 7: Process Stack Conditions 9

Table 8: Maximum Emission Concentrations 9

Table 9 Emission Rates 9

Table 10: Building Geometries 1

Figure 4: Meteorological Wind Roses 3

Table 11 Utilised Roughness Length 3

Table 12 Utilised Monin-Obukhov Lengths 3

Table 13: Sensitive Human Receptors 5

Figure 5: Modelled Sensitive Human Receptor Locations 6

Table 14: Predicted Long Term Background Pollutant Concentrations 6

Table 15: Maximum Long Term Background Pollutant Concentrations 7

Table 16: Ecological Sensitive Receptors 7

Figure 6: Modelled Sensitive Ecological Receptor Locations 8

Table 17: Nitrogen Critical Load 8

Table 18: Acid Critical Load 8

Table 19: Background Deposition Rates 9

Table 20 Conversion Factors to Determine Dry Deposition Flux 9
Table 21 Conversion Factors to Units of Equivalents 9
Table 22 Dispersion Modelling Report Requirements 11
Table 23 Predicted Annual Mean NO_2 Concentrations 13
Table 24 Predicted 1-Hour Mean NO_2 Concentrations 13
Table 25 Predicted 24-Hour SO_2 Concentrations 14
Table 26 Predicted 1-Hour SO_2 Concentrations 14
Table 27 Predicted 15-minute SO_2 Concentrations 15
Table 28 Predicted 8-Hour Rolling Mean CO Concentrations 16
Table 29 Predicted Annual Mean Benzene Concentrations 16
Table 30 Predicted 24-Hour Mean Benzene Concentrations 17
Table 31 Predicted Annual Mean NO_x Concentrations 19
Table 32 Predicted 24-Hour Mean NO_x Concentrations 19
Table 33 Predicted Annual Mean SO_2 Concentrations 19
Table 34 Predicted Annual Mean Nitrogen Deposition Rates 19
Table 35 Predicted Annual Mean Acid Deposition Rates 20

Non-Technical Summary

i. Enzygo Limited was commissioned by Japan Environmental Development and Investment UK Limited to undertake an air quality dispersion modelling assessment to support a bespoke Environmental Permit application relating to an anaerobic digestion facility located at Brains Farm, Moor Lane, Wincanton.

ii. The operation of the plant has potential to cause air quality impacts at sensitive locations due to onsite combustion sources. Air Quality dispersion modelling was undertaken to consider impacts in the vicinity of the site. Emissions concentrations were defined based on the plant operations, stack monitoring and where necessary a review of technical data sheets and literature.

iii. Model inputs were based on robust operating parameters and supplemented, where necessary, with robust assumptions. Results were processed and assessed against industry standard significance criteria.

iv. The dispersion modelling results indicated that the relevant screening criteria was met at all sensitive human receptors and impacts were screened as insignificant. Impacts on ecological receptors as result of nitrogen oxide and sulphur dioxide on surrounding designations were also screened as insignificant.

v. Based on the predictions and the use of worst-case emissions, it is considered that overall air quality impacts associated with the operation of facility would be not significant.

1.0 Introduction

1.1 Background

1.1.1 Enzygo Limited (Ltd) was commissioned by Japan Environmental Development & Investment (JEDI) UK Ltd to undertake detailed air quality dispersion modelling to support a bespoke environmental permit application for a proposed anaerobic digestion (AD) plant at Brains Farm, Wincanton (the 'Facility').

1.2 Site Location and Context

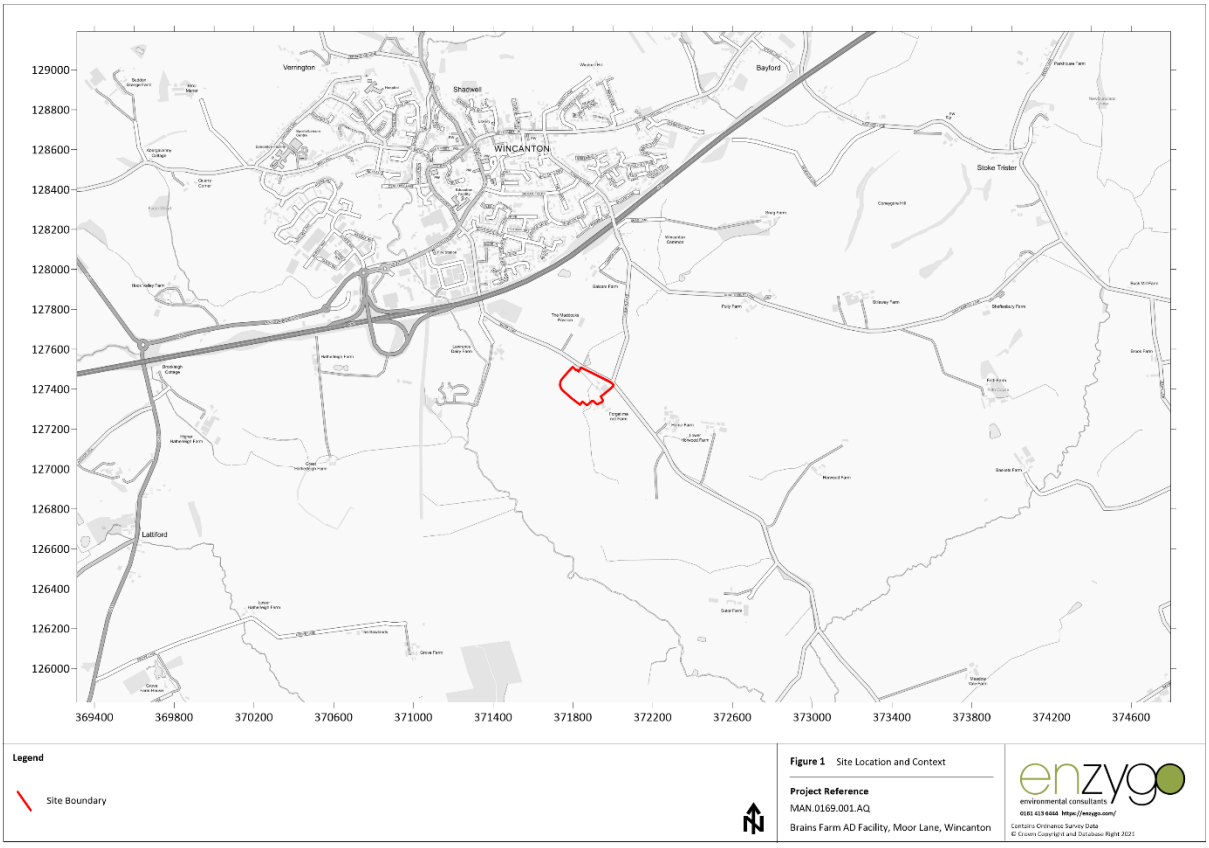
1.2.1 The Facility is located on land at Brains Farm of Moor Lane, Wincanton, BA9 9RA, at the approximate National Grid Reference (NGR): 371860, 127420 situated approximately 550 m north west of the town of Wincanton.

1.2.2 The site currently comprises a combination of arable agricultural land, agricultural buildings, a residential property, concrete hardstanding, and drainage ditches. The site is bound by Moor Lane to the north with a pond, recreational sports fields, and tennis courts beyond. The site is also bound by Moor Lane to the East with agricultural fields beyond the road. The south and west of the site is bound by agricultural fields.

1.2.3 The site is surrounded by agricultural areas with sparsely distributed working farms and residential properties in the vicinity of the site. The nearest residential property is Forget me Not Farm situated adjacent to the southeast boundary of the Facility.

1.2.4 Figure 1 shows a map of the site location and surrounding area.

Figure 1: Site Surrounding



1.3 Facility Operations

1.3.1 The proposed Facility will operate an AD process fuelled by biomass feedstock in form of energy crops, farmyard manures (FYM) and vegetable and fruit wastes. The majority of the biogas produced by the AD process will be upgraded for injection into the gas grid.

1.3.2 The annual mass of waste types to be processed at the Facility are summarised in Table 1

Table 1: Proposed Feedstocks and Annual Throughputs

Feedstock	Annual Quantity in Tonnes
Maize	15,750
Grass	4,750
Whole Crop Silage	2,850
Broiler and Layer Manure	10,000
Straw Mixed Pig and Cattle Manure	7,500
Vegetable and Fruit Waste	2,750
Straw	4,500
Top Bales of Straw	1,900
Liquid Digestate	26,650
Solid Digestate	20,810

1.3.3 A Combined Heat and Power (CHP) unit is proposed, which will utilise natural gas as a fuel and operate for up to 8,500 hours per annum. The CHP will provide heat and power to the process and have a net rate thermal input of 2.11MWth.

1.3.4 A biogas boiler, which will operate for up to 1,500 hours per annum, will utilise biogas as a fuel. The boiler will provide supplementary heat to the facility. It will have a net rated thermal input of 0.577MWth.

1.3.5 A diesel fuelled generator, with a net rated thermal input of 410 kWth will be utilised on site in the case of electrical failure. As back up, it will be utilised for less than 50 hours per annum. An emergency flare is also proposed which will only operate during periods of breakdown or maintenance of the biogas upgrading plant and/or biogas boiler.

1.3.6 The Facility comprise will comprise of the following primary elements:

- Acceptance and storage of energy crops in silage clamps;
- Acceptance and storage of agricultural manure and vegetable and fruit waste;
- Digestion of crops, vegetable and fruit waste and agricultural manures;
- Biogas collection, storage, and treatment;
- Combustion of natural gas in a CHP plant;
- Combustion of biogas in an auxiliary biogas boiler;
- Treatment of biogas in a biogas upgrading stack;
- Emergency diesel generator;
- Emergency flare operation; and

- Transfer of digestate via pipes to tankers.

1.3.7 Combustion emissions have potential to cause increases in ground level pollutant concentrations and cause impacts at sensitive human and ecological locations within the vicinity of the site. An Air Quality Assessment has therefore been undertaken to assess the significance of these impacts in line with the requirements of the Environmental Permitting (England & Wales) (Amendment) (No.2) Regulations 2016.

1.3.8 This report details the results and conclusions of the quantitative air quality impact assessment.

2.0 Legislation, Guidance and Environmental Standards

2.1 Guidance

2.1.1 The following legislation and guidance will be considered during the preparation of the Air Quality Assessment:

- The Environmental Permitting (England and Wales) (Amendment) Regulations 2016;
- The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Department for Environment, Food and Rural Affairs (DEFRA), 2007[1];
- The Air Quality Standards (Amendment) Regulations, updated on 31st December 2016;
- Local Air Quality Management Technical Guidance 2022 LAQM (TG22), DEFRA, 2022[2];
- SR2021 No 6: Anaerobic digestion facility, including use of the resultant biogas – installations, EA, Updated 5th July 2022[3]
- Air emissions risk assessment for your environmental permit, EA, updated on 21st December 2023[4]; and
- Environmental permitting: air dispersion modelling reports, EA, updated on 19th January 2021[5].

2.2 Environmental Quality Standards

2.2.1 The modelling assessment will be undertaken against relevant long-term and short-term environmental standards. The assessment levels, limit values, objectives and target values which are applicable to this assessment are summarised in Table 2 with relation to human health receptors.

Table 2: Environmental Quality Standards for Human Exposure

Pollutant	Environmental Quality Standards	
	Concentration (µg/m³)	Averaging Periods
Nitrogen dioxide (NO_2)	40	Annual mean, not to be exceeded
	200	1-hour mean; not to be exceeded more than 18 times a year
Sulphur Dioxide (SO_2)	125	24-hour mean; not to be exceeded more than 3 times a year
	350	1-hour mean; not to be exceeded more than 24 times a year
	266	15-min mean; not to be exceeded more than 35 times a year
Carbon monoxide (CO)	10,000	8-hour running mean, not to be exceeded
Total Volatile Organic Compounds (TVOC)	5	Annual limit
	30	24-hour mean limit

[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007
[2] Local Air Quality Management Technical Guidance 2022 LAQM (TG22), DEFRA, August 2022.
[3] https://www.gov.uk/government/publications/sr2021-no-6-anaerobic-digestion-facility-including-use-of-the-resultant-biogas-installations/sr2021-no-6-anaerobic-digestion-facility-including-use-of-the-resultant-biogas-installations
[4] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit
[5] https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports

2.2.2 The annual and hour limits set out for H_2S are Environmental Assessment Levels (EALs) set out in the EA guidance[4]. EALs represent a pollutant concentration in ambient air at which no significant risks to human health are expected. The remaining pollutants are assessed against their respective Ambient Air Directive (AAD) Limit Values, either under EU directives or UK law.

2.2.3 These criteria are collectively referred to as Environmental Quality Standards (EQSs). Table 3 summarises the advice provided in the DEFRA guidance LAQM (TG22)[2] on where the EQSs apply.

Table 3: Where EQS Apply

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed Building façades of residential properties, schools, hospitals, care homes etc.	Building facades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
24-hour and 8 hour mean	As above together with hotels, and gardens of residential properties	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
1-hour mean	As above, kerbside sites (for example, pavements of busy shopping streets), parts of car parks, bus stations and railway stations etc. which are not fully enclosed, and any location where members of the public might reasonably be expected to spend one hour or more	Kerbside sites where the public would not be expected to have regular access

2.3 Ecological Critical Levels

2.3.1 The assessment of impacts upon ecological designations will be undertaken in accordance with the EA guidance[4]. Predicted impacts will be compared against appropriate Critical Loads (CLDs) and Critical Levels (CLVs) obtained from the UK Air Pollution Information System (APIS)[6] to determine significance. Table 4 presents the CLVs considered within this assessment. CLVs have been assigned based on worse case sensitivity.

Table 4: Critical Levels for the Protection of Vegetation

Pollutant	Critical Level	
	Concentration (µg/m³)	Averaging Periods
NO_x	30	Annual mean
	75 - 200	24-hour mean
SO_2	10 - 20	Annual mean

2.3.2 CLDs used in this assessment are detailed in Section 4.2 for nutrient nitrogen and acidity which refers to deposition of pollutants, while a CLVs refers to pollutant concentrations in the atmosphere.

[6] http://www.apis.ac.uk/

3.0 Dispersion Modelling Inputs

3.1 Emission Sources

3.1.1 The following sources have been considered in the assessment and reflect the relevant emission points at the proposed Facility:

- A1 - Natural gas fuelled CHP Engine;
- A2 - Biogas boiler;
- A3 - Emissions from the Emergency High Temperature Flare Stack;
- A4 - Biogas Upgrading Stack;
- A5 - Emergency diesel generator; and
- Process Vents and Pressure Release Valves.

3.1.2 Emission sources A3 (Flare) , A5 (Emergency Generator) and the Process Vents and Pressure Relief Values will operate infrequently and typically during emergency scenarios. Given their reduced operating schedules, impacts from these sources are considered insignificant and were not assessed further in the AQA.

3.1.3 JEDI UK Ltd have confirmed that emissions associated with the source A4 (Biogas Upgrading Stack) comprises 98% carbon dioxide (CO_2), with residual concentrations of methane (CH_4) and hydrogen sulphide (H_2S). As such the residual emission release from source A4 are considered insignificant and were not assessed further in the AQA.

3.1.4 Table 5 shows the location of modelled emission sources.

Table 5: Stack Locations

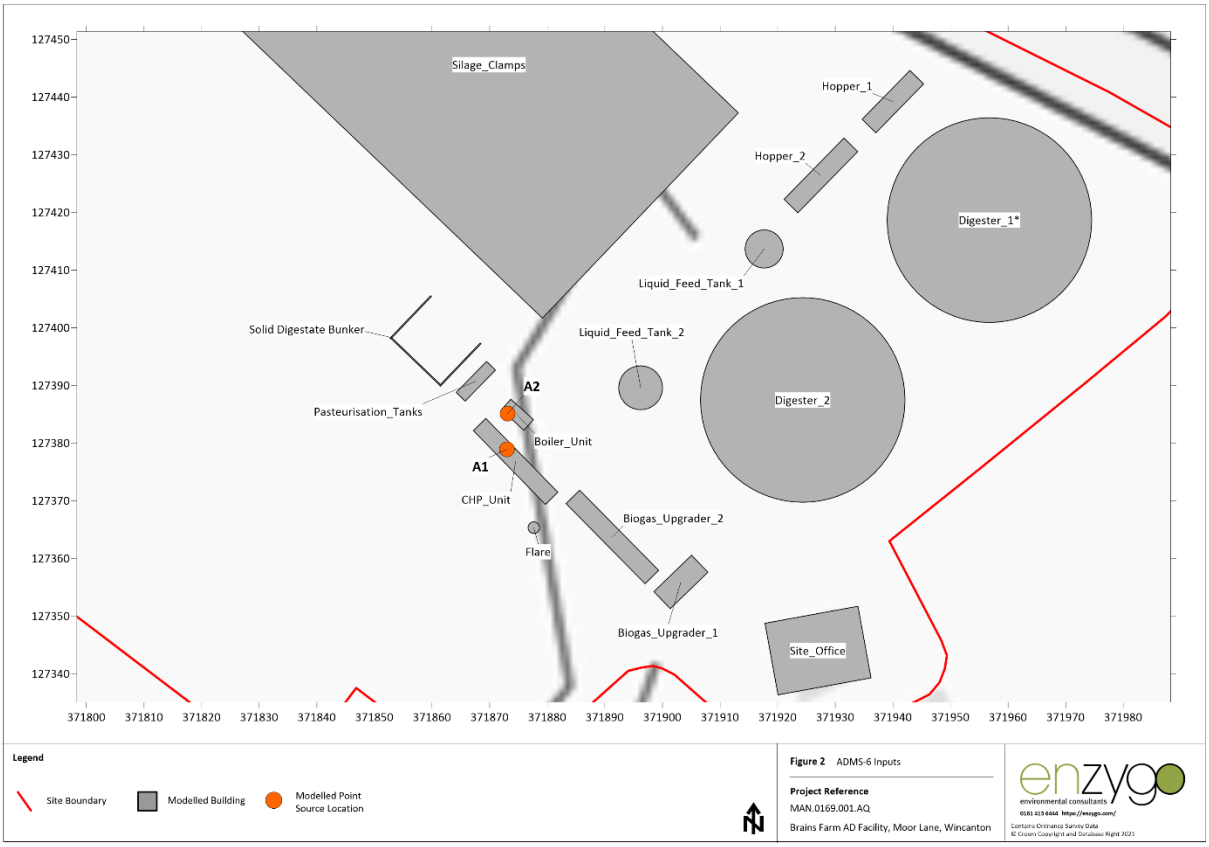
Emission Source		NGR	
		X	Y
A1	CHP Engine	509331.7	463996.6
A2	Biogas Boiler	509335.8	464001.8

3.2 Dispersion Modelling

3.2.1 The information detailed in this section were entered into the ADMS 6 (v6.0.0.1) software, which is developed by Cambridge Environmental Research Consultants (CERC) Ltd. Outputs were processed to predict pollutant concentrations in the vicinity of the site to allow comparison against relevant impact significance criteria.

3.2.2 Figure 2 shows a graphical representation of the modelled air pollution sources.

Figure 2: ADMS-6 Modelling Inputs



3.3 Modelling Scenarios and Emissions

3.3.1 The pollutant species and averaging periods considered relevant to this assessment are summarised in Table 6. Unless stated modelled pollutant species and average periods relate to human exposure.

Table 6: Dispersion Modelling Scenarios

Pollutant	Modelled As	
	Long Term	Short Term
NO_2	Annual mean	99.79th percentile (%ile) 1-hour mean
NO_x	Annual mean *(Ecological Impacts)*	24-hour mean (Ecological Impacts)
SO_2	-	99.9%ile 15-minute mean
	-	99.73%ile 1-hour mean
	-	99.18%ile 24-hour mean
	Annual mean (*Ecological Impacts)*	-
CO	8-hour rolling mean	-
TVOC as Benzene	Annual mean	-
	24-hour mean	-
Nitrogen Deposition	Annual mean (Ecological Impacts*)*	-
Acid Deposition	Annual mean (Ecological Impacts)	-

Process Conditions

3.3.2 Process conditions for source A1 and A2 were obtained from the technical datasheets provided by the manufacturer. Specifications for each source were provided by JEDI UK Ltd. Reference should be made to Table 7 for the parameters for each emission stack.

Table 7: Process Stack Conditions

Parameter	Unit	A1[(a)]	A2[(b)]
Stack height	m	10	5.5
Stack diameter	m	0.30	0.25
Flue gas efflux velocity	m/s	35.5	6.27
Volumetric flow rate	m^3/s	2.51	0.308
Temperature	˚C	425	180
Moisture Content	%	11	11
Oxygen Content	%	9	9

[a] Data from MWM TCG 3016 V16.technical datasheet - Referenced @ 5% Oxygen, STP.
[b] Data from Viessmann VITOPLEX 200 Boiler

Stack Emissions

3.3.3 Emission concentrations associated with A1 were based on the relevant maximum Emission Limit Values (ELVs) obtained from Annex II, of MCP regulations[7]. ELV with A2 were obtained from the EA's statutory guidance[8]. Emission concentrations detailed in Table 8 are referenced at standard temperature (273K) and pressure (101.3kPa) and, in the case of A1 as a dry gas at 5% oxygen, and A2 as a dry gas at 3% O_2.

Table 8: Maximum Emission Concentrations

Pollutant	Emission Concentrations (Nmg/m^3)	
	A1	A2
NO_x (as NO_2)	95[(a)]	500 ([b])
SO_2	-	350 [(b)]
CO	1,400*-	1,400 [(b)]
TVOC (as Benzene)	-	1,000 [(b)]

a. SR2021 No 6: ELV for new for new engines and gas turbines burning natural gas.

b. SR2021 No 6: Maximum stated ELV for plant burning biogas: *including CO for CHP unit.

3.3.4 The mass emissions rates shown in Table 9 were calculated to using flow conditions provided in Table 7 and maximum emission concentrations in Table 8.

Table 9 Emission Rates

Pollutant	Emission Rate (g/s)	
	A1	A2
NO_x (as NO_2)	0.062	0.055
SO_2	-	0.039
CO	0.919	0.154
TVOC (as Benzene)	-	0.110

[7] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32015L2193#ntc28-L_2015313EN.01001501-E0028 [Accessed 26/05/2023]
[8] SR2021 No 6: Anaerobic digestion facility, including use of the resultant biogas – installations, 17th May 2022.

3.4 Time Varied Emissions

3.4.1 JEDI UK Ltd have confirmed that A1 will operate continuously for 8,500 hours, with A2 operating annually for approximately 1,500 hours. Factors of 0.970 and 0.171 based on the proportion of operating hours in the year were applied to the annual mean PCs of sources A1 and A2 were respectively.

3.4.2 Short term impacts were modelled with the boiler running continuously to consider peak hour contributions.

3.5 Terrain Data

3.5.1 Areas of complex terrain have potential to affect the dispersion of pollutants which vary dependent on the height and location of modelled emission sources. Ordnance Survey Landform Panorama terrain data was pre-processed within the ADMS-6 model and covers the Facility and surrounding receptor locations.

3.6 Building Effects

3.6.1 Buildings can influence the dispersion of pollutant and may lead to increases to ground level concentrations. A review of adjacent buildings was therefore undertaken and subsequently included within the model and are summarised in Table 10.

3.6.2 Onsite building heights were provided by JEDI UK Ltd. It should be noted that the effect of buildings on dispersion can only be modelled for points source. As such the modelled area/line sources do not take account of building effects.

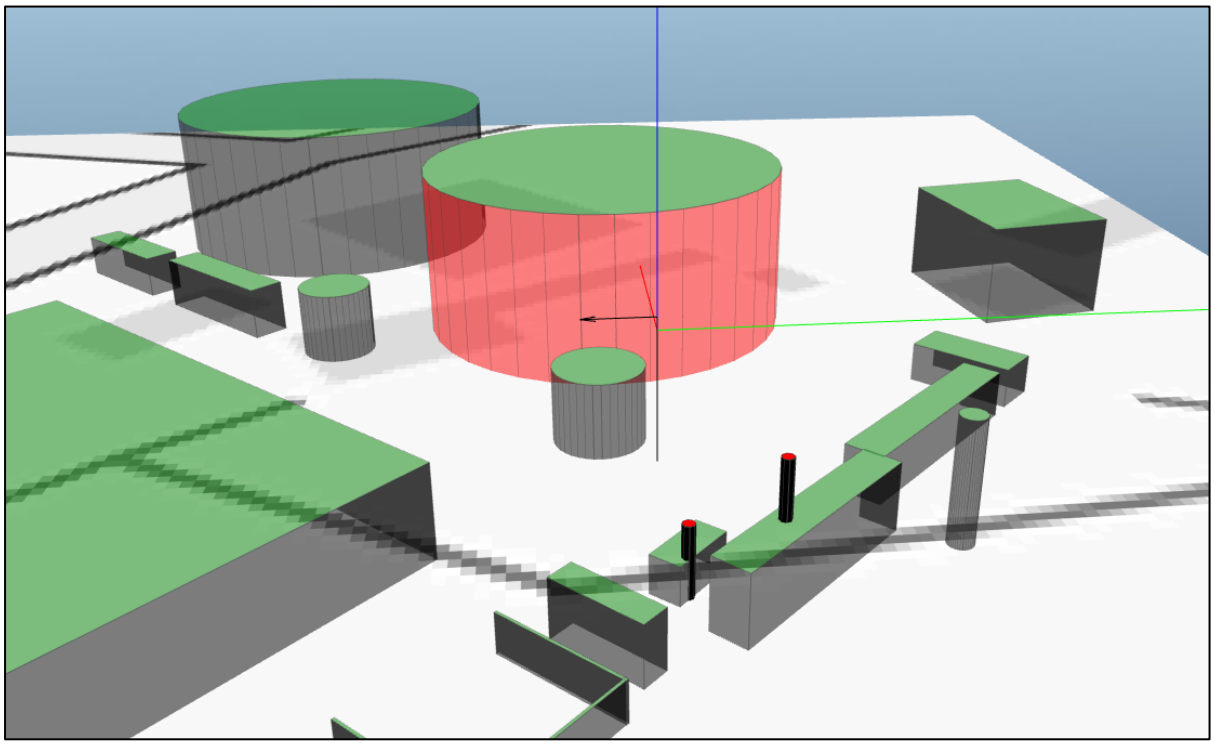
Table 10: Building Geometries

Building		NGR (m)		Height (m)	Length/ Diameter (m)	Width (m)	Angle (˚)
		X	Y				
1	TNV Digester	371956.8	127418.7	16.0	35.5	Circular	N/A
2	Post Digester	371924.4	127387.5	16.0	35.5	Circular	N/A
3	Feed Hopper 1	371940.0	127439.2	4.2	11.9	3.3	224.4
4	Feed Hopper 2	371927.5	127426.4	5.0	3.4	14.9	134.4
5	Silage Clamps	371868.1	127443.8	7.5	75.7	49.2	130.3
6	Liquid Tanks 1	371917.7	127413.6	6.5	6.6	Circular	N/A
7	Liquid Tanks 2	371896.2	127389.6	6.5	7.6	Circular	N/A
8	Site Office	371927.0	127344.0	10.0	12.6	16.4	169.6
9	Grid Entry Units	371903.2	127355.9	3.5	9.1	4.1	226.0
10	Biogas Upgrader	371891.3	127363.7	4.0	3.3	19.5	225.4
11	CHP Unit	371874.5	127376.8	5.5	3.0	17.9	225.7
12	Boiler Unit	371874.8	127384.9	3.0	2.5	5.3	222.2
13	Pasteurisation Units	371867.6	127390.7	4.5	2.2	7.5	134.3
14	Flare	371877.7	127365.3	3.0	2.0	Circular	N/A
15	Digestate Bunker Wall	371856.3	127401.8	3.0	0.2	10.2	133.8
16	Digestate Bunker Wall	371864.9	127393.6	3.0	0.2	10.2	133.8
17	Digestate Bunker Wall	371857.2	127394.1	3.0	0.3	12.0	223.8

3.6.3 Reference should be made to Figure 2 for a graphical representation of the modelled building layout and ADMS-6 model inputs. A three-dimensional representation of the modelled building layout is provided below.

3.6.4 A three-dimensional representation of the modelled building layout is provided below.

Figure 3: 3D Model Layout

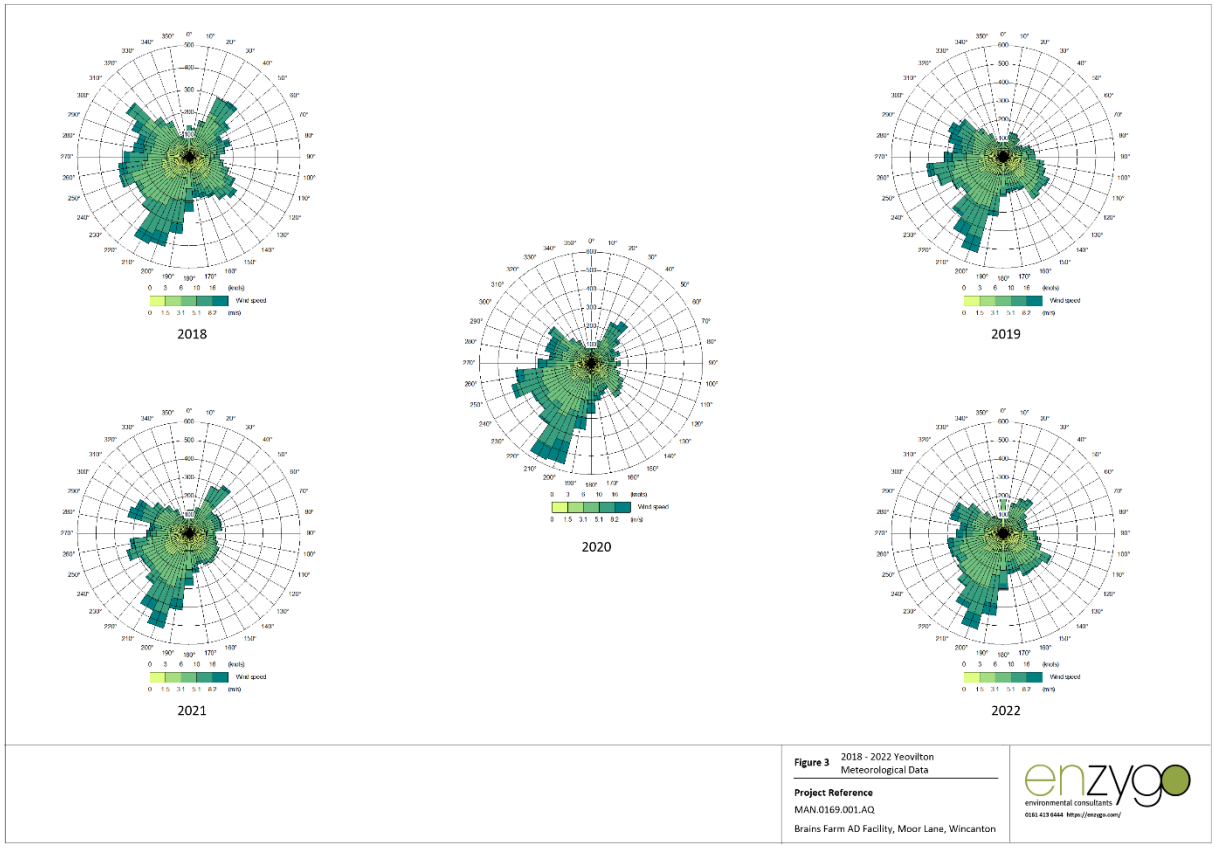


3.7 Meteorological Data

3.7.1 Hourly sequential data used in this assessment was obtain from Yeovilton meteorological station, located 17 km southwest of the Facility. Both sites are located within similar rural contexts and share comparable topographies. The choice of this parameter therefore provides a suitable representative of metrological conditions across the modelled domain.

3.7.2 Maximum emissions across the five years of meteorological data (2018 - 2022) were utilised to ensure a worse case assessment. All meteorological data was provided by ADM Ltd. Figure 4 shows the meteorological wind roses.

Figure 4: Meteorological Wind Roses



Roughness Length

3.7.3 The specific roughness length (z_0) values specified with the ADMS-6 model is summarised in Table 11.

Table 11 Utilised Roughness Length

Location	Roughness length (m)	ADMS Description
Application Site and Meteorological Station	0.2	Agricultural (min)

Monin-Obukhov Length

3.7.4 The Monin-Obukhov length values are summarised in Table 12.

Table 12 Utilised Monin-Obukhov Lengths

Location	Monin-Obukhov length (m)	ADMS Description
Application Site and Meteorological Station	10	Small Towns <50,000

Surface Albedo and Priestley-Taylor Parameter

3.7.5 The surface albedo and Priestley-Taylor parameters used in the assessment were the model default values of 0.23 and 1 respectively.

3.8 NO_x to NO_2 Conversion

3.8.1 Ground level NOx concentrations were predicted through dispersion modelling. NO_2 concentrations reported in the results section assume conversion from NO_x to NO_2, based upon EA guidance[4] detailed below:

- 35% for short-term average concentrations; and
- 70% for long-term average concentrations.

3.9 15-minute Sulphur Dioxide Concentration Predictions

3.9.1 Throughout the assessment, 15-minute mean SO_2 concentrations have been calculated using the following correction factor based upon empirical relationships with the 99.9th percentile of 1-hour means, as described in EA guidance:

99.9th percentile of 15-minute means = 1.34 x 99.9th percentile of 1-hour means

4.0 Baseline and Sensitive Receptors

4.1 Human Receptors

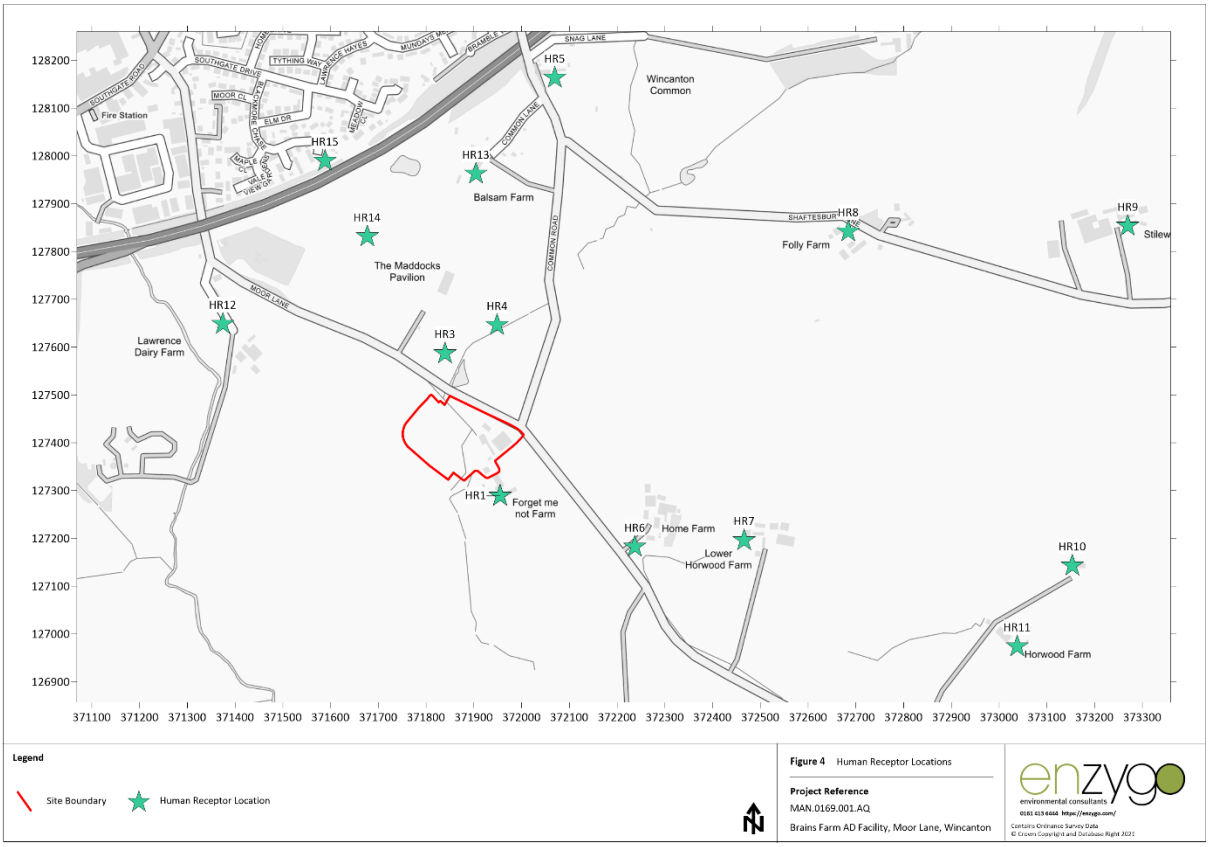
4.1.1 A sensitive receptor is defined as any location which may be affected by changes in air quality. A desk-top study was undertaken in order to identify sensitive receptor locations which require a detailed assessment. Identified receptors were modelled at the minimum height of relevant exposure. The modelled receptors are summarised in Table 13.

Table 13: Sensitive Human Receptors

Receptor		Use	NGR (m)		Distance from Centre of Site (m)	Height (m)
			X	Y		
HR1	Forget Me Not Farm	Residential	371955.0	127289.0	137	1.5
HR2	Wincanton Sports Ground	Recreational	371839.5	127587.0	137	1.5
HR3	Wincanton Sports Ground	Recreational	371948.9	127645.9	189	1.5
HR4	Vine House, Common Road	Residential	372069.5	128163.2	254	1.5
HR5	Home Farm	Residential	372237.1	127182.1	785	1.5
HR6	Lower Horwood Farm	Residential	372466.1	127196.0	421	1.5
HR7	Folly Farm	Residential	372684.1	127842.0	623	1.5
HR8	Stileaway Farm	Residential	373269.7	127853.3	919	1.5
HR9	Higher Horwood Farm	Residential	373153.4	127142.7	1,463	1.5
HR10	Higher Horwood Farm Cottage	Residential	373037.8	126974.0	1,302	1.5
HR11	Lawerence Dairy Farm	Residential	371374.1	127648.4	1,236	1.5
HR12	Balsalm Farm	Residential	371904.4	127962.3	561	1.5
HR13	Allotments, Moor Lane	Residential	371676.7	127831.2	561	1.5
HR14	40 Blackmore Chase	Residential	371588.3	127989.5	474	1.5

4.1.2 Figure 5 shows a graphical representation of the receptor locations.

Figure 5: Modelled Sensitive Human Receptor Locations



Human Receptor Baseline

4.1.3 A desktop study was undertaken to define the baseline air quality within the vicinity of the Facility. The baseline year will correspond with either the current year or the most recent year that monitoring data is available. 2022 predicted background concentrations are summarised in Table 14.

Table 14: Predicted Long Term Background Pollutant Concentrations

Receptor	Predicted Background Concentration (µg/m³)				
	NO_x	NO_2	SO_2	CO	TVOC
HR1	6.08	4.86	183.00	2.59	0.14
HR2	6.08	4.86	183.00	2.59	0.14
HR3	6.08	4.86	183.00	2.59	0.14
HR4	6.18	4.95	186.00	2.38	0.14
HR5	4.69	3.79	182.00	2.30	0.14
HR6	4.69	3.79	182.00	2.30	0.14
HR7	4.69	3.79	182.00	2.30	0.14
HR8	4.39	3.55	181.00	2.09	0.13
HR9	4.39	3.55	181.00	2.09	0.13
HR10	4.20	3.40	176.00	2.00	0.11
HR11	6.08	4.86	183.00	2.59	0.14
HR12	6.08	4.86	183.00	2.59	0.14
HR13	6.08	4.86	183.00	2.59	0.14

Receptor	Predicted Background Concentration (µg/m³)				
	NO_x	NO_2	SO_2	CO	TVOC
HR14	6.08	4.86	183.00	2.59	0.14

4.1.4 Background concentrations of NO_x and NO_2, were obtained from DEFRA website[9] for 2022, with CO, SO_2 and benzene predictions obtained from the 2001 base maps. These are the most reliable and recent predictions available and are therefore considered to provide a reasonable representation of background concentrations in the vicinity of the site.

4.1.5 To provide a conservative assessment the maximum background concentrations across the study area were applied to all receptor locations as set out in Table 15

Table 15: Maximum Long Term Background Pollutant Concentrations

Receptor	Predicted Background Concentration (µg/m³)				
	NO_x	NO_2	SO_2	CO	TVOC
All Locations	6.18	4.95	186.00	2.59	0.14

Short term Background Concentrations

4.1.6 It was assumed that the short-term background concentration of a substance is twice its long-term concentrations provided in Table 14 as suggested within EA risk assessment for your environmental permit guidance[4].

4.2 Ecological Sensitive Receptors

4.2.1 The EA guidance 'Air emissions risk assessment for your environmental permit'[4] states:

"Note that conservation sites need only be considered where they fall within set distances of the activity:

- *Special Protection Areas (SPAs), Special Areas of Conservation (SACs) or RAMSAR sites within 10km of the installation; and*
- *Site of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs), Local Nature Reserves (LNRs), Local Wildlife Site (LWS) and Ancient Woodlands (AW) within 2km of the location."*

4.2.2 A desk top study was undertaken using the Multi-Agency Geographic Information for the Countryside (MAGIC)[10] to identify statutory and locally designated sites within the distances stated above. The study confirmed no SPAs, SACs or RAMSAR sites within 10 km and no LNRs, NNRs or SSSIs with 2km of the Facility.

4.2.3 The EAs nature and heritage conservation screening assessment did identify one Local Wildlife Site (LWS) within 2 km of the proposed Facility. The Common Lane LWS is located approximately 1,635 m south of the site as detailed in Table 16.

Table 16: Ecological Sensitive Receptors

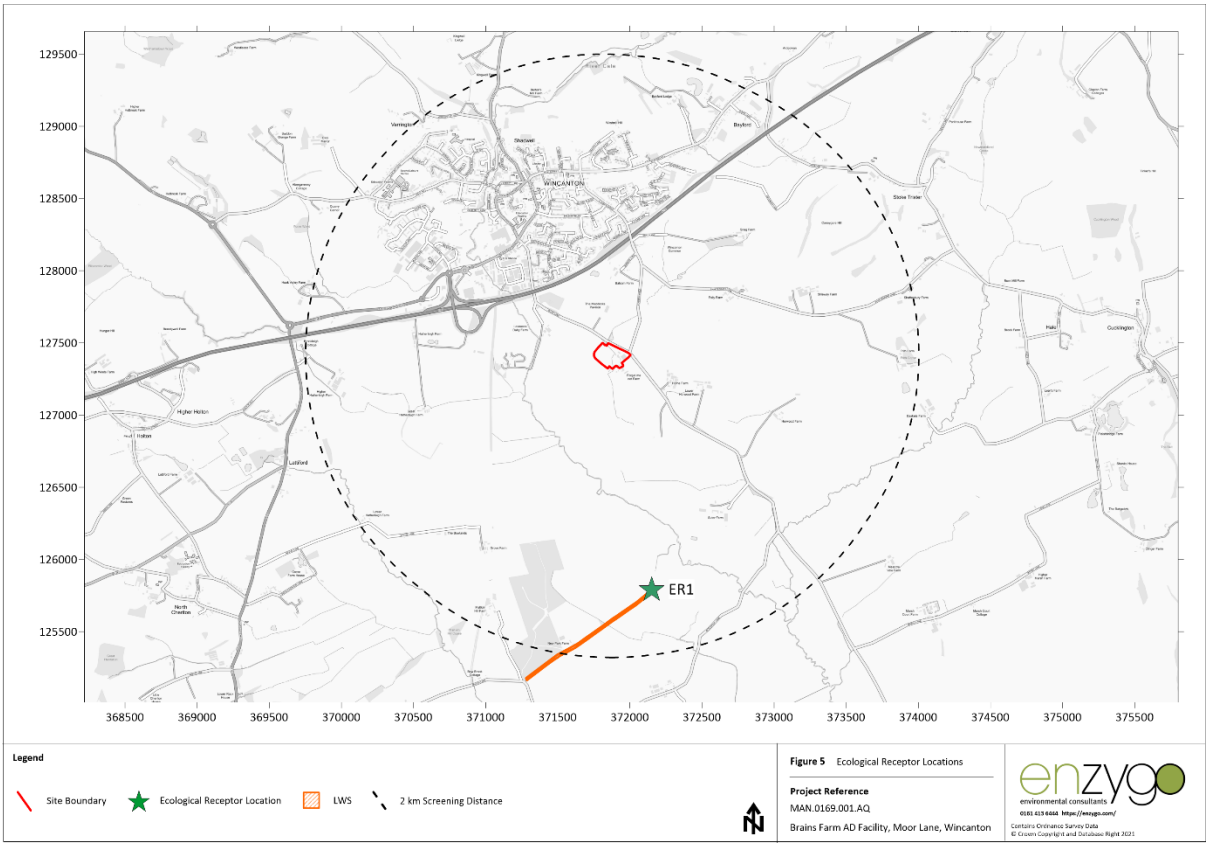
ID	Ecological Receptor	NGR		Closest Distance to Facility (m)
		X	Y	
ER1	Common Lane LWS	372152.2	125790.3	1,635

[9] https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018
[10] https://magic.defra.gov.uk/MagicMap.aspx

4.2.4 The LWS is a green lane with species-rich flora and good hedge system with semi-mature oak standards. A review of Living England Habitat Map provided by MAGIC confirmed the presence of acid, calcareous and neutral grasslands at the LWS site.

4.2.5 The location of the Common Lane LWS is displayed in Figure 6.

Figure 6: Modelled Sensitive Ecological Receptor Locations



Ecological Receptor Baseline

4.2.6 CLDs are designated within the UK based on the sensitivity and relevant features of the receiving habitat. A review of the APIS website was undertaken to identify suitable habitat descriptions and associated CLDs. For the receptors with multiple habitats, the most sensitive habitat has been taken for both nitrogen and acid deposition. The CLDs for nitrogen deposition are presented in Table 17.

Table 17: Nitrogen Critical Load

ID	Designation	Nitrogen Class	Nitrogen Critical Load (kgN/ha/yr)	
			Min	Max
ER1	Common Lane LWS	Calcareous Grassland	5	10

4.2.7 Table 18 shows the relevant critical loads for acid deposition.

Table 18: Acid Critical Load

ID	Designation	Acidity Class	Critical Load (ke/ha/yr)		
			CLminN	CLmaxN	CLmaxS
ER1	Common Lane LWS	Acid Grassland	0.438	4.548	4.110

*APIS database accessed 31/05/2023

4.2.8 Background deposition rates and concentrations were downloaded from the APIS website and are summarised in Table 19 and represent the maximum predicted concentrations at each designation.

Table 19: Background Deposition Rates

ID	Nitrogen Deposition (kgN/ha/yr)	Acid Deposition (keq/ha/yr)		Background Concentration ug/m_3	
		N	S	NO_x	SO_2
ER1	19.70	1.39	0.11	5.98	0.60

*APIS database accessed 31/05/2023

Deposition Rates

4.2.9 Deposition rates were calculated using the conversion factors provided within EA document 'Technical Guidance on Detailed Modelling approach for an Appropriate Assessment for Emissions to Air AQTAG 06[11]. Predicted pollutant concentrations were multiplied by the relevant deposition velocity and conversion factor to calculate the speciated dry deposition flux. The conversion factors used are presented within Table 20.

Table 20 Conversion Factors to Determine Dry Deposition Flux

Pollutant	Grassland Deposition Velocity (m/s)	Forest Deposition Velocity (m/s)	Conversion Factor (µg/m^2/s to kg/ha/yr)	Conversion Factor (µg/m^2/s to keq/ha/yr)
NO_2	0.0015	0.003	96	6.84
SO_2	0.012	0.024	157.7	9.84

4.2.10 Predicted ground level pollutant concentrations were converted to kilo-equivalent ion depositions (keq/ha/yr) for comparison with the critical load for acid deposition at each of the identified ecological receptors. The standard conversion factors are shown in Table 21.

Table 21 Conversion Factors to Units of Equivalents

Species	Conversion Factors from kg/ha/yr to keq/ha/yr
N	0.07143
S	0.06250

4.2.11 The proportion of the EQS consisting of the PC and PEC were then calculated.

4.3 Assessment Criteria and Significance of Impacts

EA Guidance Criteria

4.3.1 Guidance for assessing the significance of emissions impacts from point sources are also given in the EA's guidance[4]. Predicted pollutant concentrations are summarised in the following formats:

- Process contribution (PC) - Predicted pollutant concentration as a result of emissions from the site only; and
- Predicted environmental concentration (PEC) - Total predicted pollutant concentration as a result of emissions from the site and existing baseline levels.

[11] AQTAG 06: Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air, EA, 2014

Initial Screening Stage

4.3.2 The significance of predicted impact was assessed in accordance with EA criteria and through consideration of likely effects as a result of the proposals. The EA guidance states that process contributions can be considered insignificant if:

- the short-term PC is less than 10% of the short-term environmental standard; and
- the long-term PC is less than 1% of the long-term environmental standard.

4.3.3 If both criteria are met predicted impacts can be considered insignificant and no further analysis is required. It is critical to note that exceedances of the 1% or 10% insignificance criteria does not by itself correspond to significant risk or adverse harm.

Second Screening Stage

4.3.4 If the above criteria are not met, then a second stage of screening is required to determine the impact of the PEC:

- The short-term PC is less than 20% of the short-term environmental standards minus twice the long-term background concentration; and
- The long-term PEC is less than 70% of the long-term environmental standards.

4.3.5 If both criteria are met during the second stage of screening, then predicted impacts can be considered insignificant. Should these criteria be exceeded then the PEC should be checked against the EQS.

Ecological Screening

4.3.6 If emissions that affect LWS meet both of the following criteria, they can be considered insignificant:

- The short-term PC is less than 100% of the short-term environmental standard; and
- The long-term PC is less than 100% of the long-term environmental standard.

4.3.7 In addition, the EA guidance also states that the APIS critical load function tool should be used to determine whether there is an exceedance of deposition of nutrient nitrogen or acidity, as the standard of exceedance is site-specific.

4.3.8 It is again critical to note that exceedances of the above insignificance criteria do not directly correspond to significant risk or adverse harm.

4.4 Modelling Uncertainties

4.4.1 Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:

- Model uncertainty - due to model limitations;
- Data uncertainty - due to errors in input data, including emission concentration estimates, operational procedures, land use characteristics and meteorology; and
- Variability - randomness of measurements used.

4.4.2 The analysis of maximum emissions across five years of meteorological data (2018 -2022) accounts for variations in modelled predictions. Additionally, worse case assumptions regarding

the application of maximum ELVs, operating envelopes, and background concentrations further minimise podetial uncertainties.

4.5 Assumptions

4.5.1 The following assumptions were made during the dispersion modelling:

- Concurrent operation for emission sources A1 and A2;
- All combustion sources assumed at 100% loading;
- Maximum permitted emission concentrations were applied to A1 and A2;
- Emission concentrations associated with A1 rebased on maximum ELVs stated in the MCPD regulations;
- Emission concentrations associated with A2 are based on maximum ELV provided by the EAs statutory guidance - *SR2021 No 6: Anaerobic digestion facility, including use of the resultant biogas – installations, 17th May 2022*[8]. The application of such ELV is likely to provide an overestimation of actual conditions;
- In accordance with the EA guidance it was assumed that the entire TVOC emissions consisted of C_6H_6 benzene given that the proportions of individual species are unknown. However, It is anticipated that benzene emissions would represent a much smaller proportion of the total TVOC content;
- It is understood that the flare, vents and PRVs will only operate during emergency scenarios, either a result of system failure or abnormal gas production. Given the reduced operating schedule, impacts are considered insignificant and have not been assessed; and
- Following a review of the Somerset Council Planning Portal and EA's Public Register no significant proposed or recently consented livestock or agricultural activities are located with 3 km of the Facility. Therefore, potential in combination effects have been screened out of the assessment. Furthermore, it is considered the background concentrations and levels used in the assessment account for PC from local activities up to 2020.

4.6 Dispersion Modelling Report Requirements

4.6.1 Table 22 provides the checklist of dispersion modelling report requirements.

Table 22 Dispersion Modelling Report Requirements

Item	Location within Report
Location map	Figure 1
List of pollutants modelled and relevant guidelines	Table 2, Table 3 and Table 4
Details of modelled scenarios	Section 3.3d
Details of relevant ambient concentrations used	Table 14 and Table 19
Model description and justification	Section 3.2
Special model treatments used	Section 3.3 to 3.12
Table of emission parameters used	Table 8

Item	Location within Report
Details of modelled domain and receptors	Section 4.0 and Figure 5 and Figure 6
Details of meteorological data used	Section 3.7
Details of terrain treatment	Section 3.5
Details of building treatment	Section 3.6 and Table 10

5.0 Results

5.1 Introduction

5.1.1 Dispersion modelling was undertaken with the inputs described in Section 3.0.

5.1.2 Predicted pollutant concentrations were predicted separately for 5 assessment years and the maximum concentration reported for each pollutant. Impact significance was determined using the EA's guidance[5]. Impacts upon receptor locations relate to the operation of onsite combustion process associated with emission sources A1 and A2.

5.2 Human Receptors

Annual Mean NO_2

Table 23 Predicted Annual Mean NO_2 Concentrations

ID	Predicted Concentration (µg/m^3)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
HR1	0.30	6.5	0.76	16.20
HR2	0.18	6.4	0.45	15.90
HR3	0.22	6.4	0.54	15.99
HR4	0.04	6.2	0.10	15.55
HR5	0.07	6.2	0.17	15.62
HR6	0.04	6.2	0.09	15.54
HR7	0.03	6.2	0.06	15.51
HR8	0.01	6.2	0.03	15.48
HR9	0.01	6.2	0.04	15.48
HR10	0.01	6.2	0.04	15.48
HR11	0.04	6.2	0.10	15.55
HR12	0.05	6.2	0.13	15.58
HR13	0.05	6.2	0.12	15.57
HR14	0.03	6.2	0.08	15.53

Predicted concentrations assessed against the relevant annual mean EQS of 40 µg/m^3.

1-hour Mean NO_2

Table 24 Predicted 1-Hour Mean NO_2 Concentrations

ID	Predicted Concentration (µg/m^3)		Proportion of EQS (%)	
	PC	PEC	PC	PC[a]
HR1	5.92	18.27	2.96	3.15
HR2	4.23	16.59	2.12	2.26
HR3	3.60	15.96	1.80	1.92
HR4	1.24	13.59	0.62	0.66
HR5	1.73	14.09	0.86	0.92
HR6	1.35	13.71	0.67	0.72
HR7	1.05	13.41	0.53	0.56
HR8	0.64	13.00	0.32	0.34

ID	Predicted Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PC[a]
HR9	0.55	12.91	0.28	0.29
HR10	0.62	12.98	0.31	0.33
HR11	1.76	14.11	0.88	0.94
HR12	1.62	13.98	0.81	0.86
HR13	1.90	14.25	0.95	1.01
HR14	1.35	13.71	0.68	0.72

Predicted concentrations were assessed against the relevant 99.79%ile 1-hour mean EQS of 200 µg/m³
a: PC proportion of the EQS minus twice the long-term background.

5.2.1 As presented in Table 23 and Table 24, PC proportions of the annual and 1-hour EQS are less than 1% and 10%, respectively, at all receptor locations. Impacts can be screened out as insignificant based on the initial EA screening criteria and no further analysis is required for this pollutant.

5.2.2 Based on these predictions no unacceptable adverse impacts are associated with NO_2 emissions.

24-Hour Mean (99.18%ile) SO_2

Table 25 Predicted 24-Hour SO_2 Concentrations

ID	Predicted Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR1	7.95	13.13	6.36	6.63
HR2	4.70	9.88	3.76	3.93
HR3	4.49	9.67	3.59	3.75
HR4	1.13	6.31	0.90	0.94
HR5	1.91	7.09	1.53	1.60
HR6	1.64	6.82	1.31	1.37
HR7	1.03	6.21	0.82	0.86
HR8	0.46	5.64	0.37	0.38
HR9	0.61	5.79	0.49	0.51
HR10	0.70	5.88	0.56	0.58
HR11	2.16	7.34	1.73	1.80
HR12	1.53	6.71	1.22	1.27
HR13	2.46	7.64	1.97	2.05
HR14	1.67	6.85	1.34	1.40

Predicted concentrations assessed against the 24-hour mean EQS of 125 µg/m³.
a: PC proportion of the EQS minus twice the long-term background

1-Hour Mean (99.73%ile) SO_2

Table 26 Predicted 1-Hour SO_2 Concentrations

ID	Predicted Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR1	8.89	14.07	2.54	2.58
HR2	6.40	11.58	1.83	1.85

ID	Predicted Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR3	5.60	10.78	1.60	1.63
HR4	1.89	7.07	0.54	0.55
HR5	2.49	7.67	0.71	0.72
HR6	2.04	7.22	0.58	0.59
HR7	1.51	6.69	0.43	0.44
HR8	0.86	6.04	0.25	0.25
HR9	0.80	5.98	0.23	0.23
HR10	0.94	6.12	0.27	0.27
HR11	2.69	7.87	0.77	0.78
HR12	2.39	7.57	0.68	0.69
HR13	2.80	7.98	0.80	0.81
HR14	2.06	7.24	0.59	0.60

Predicted concentrations assessed the 1-hour mean EQS of 350 µg/m³.
a: PC proportion of the EQS minus twice the long-term background

15-Minute Mean (99.90%ile) SO_2

Table 27 Predicted 15-minute SO_2 Concentrations

ID	Predicted Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR1	12.50	17.68	4.70	4.79
HR2	9.90	15.08	3.72	3.80
HR3	8.60	13.78	3.23	3.30
HR4	2.68	7.86	1.01	1.03
HR5	4.16	9.34	1.57	1.60
HR6	3.26	8.44	1.22	1.25
HR7	2.29	7.47	0.86	0.88
HR8	1.21	6.39	0.45	0.46
HR9	1.20	6.38	0.45	0.46
HR10	1.53	6.71	0.58	0.59
HR11	4.07	9.25	1.53	1.56
HR12	3.90	9.08	1.47	1.50
HR13	4.45	9.63	1.67	1.71
HR14	3.29	8.47	1.24	1.26

Predicted concentrations assessed against the 15-minute mean EQS of 266 µg/m³.
a: PC proportion of the EQS minus twice the long-term background

5.2.3 As presented in Table 25, Table 26 and Table 27, PC proportions of the 24-hour, 1-hour and 15 minute mean EQS are less than 10% at all receptor locations. Impacts can be screened out as insignificant based on the initial EA screening criteria and no further analysis is required for this pollutant.

5.2.4 Considering the above no unacceptable adverse impacts are associated with SO_2 emissions.

8-hour Rolling Mean CO

5.2.5 Predicted 8-hour rolling mean CO concentrations are summarised in Table 28.

Table 28 Predicted 8-Hour Rolling Mean CO Concentrations

ID	Predicted Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC[a]
HR1	1854.91	2226.91	**18.55**	19.27
HR2	595.23	967.23	5.95	6.18
HR3	386.17	758.17	3.86	4.01
HR4	25.69	397.69	0.26	0.27
HR5	107.82	479.82	1.08	1.12
HR6	41.85	413.85	0.42	0.43
HR7	34.09	406.09	0.34	0.35
HR8	10.93	382.93	0.11	0.11
HR9	8.89	380.89	0.09	0.09
HR10	8.12	380.12	0.08	0.08
HR11	84.67	456.67	0.85	0.88
HR12	38.33	410.33	0.38	0.40
HR13	80.15	452.15	0.80	0.83
HR14	38.07	410.07	0.38	0.40

Concentrations assessed against 8-hour rolling mean EQS of 10,000 µg/m³.
a: PEC proportion of the EQS minus twice the long-term background

5.2.6 As presented in Table 28, the PC proportion of the 8-hour rolling mean EQS is greater than 10% at one receptor location (HR1). Impacts at this location cannot be screened out as insignificant based on the initial EA screening criteria and further analysis is required. At all other locations the PC proportion of the 8-hour rolling mean EQS is less than 10% and impacts are screened out as insignificant

5.2.7 The second stage of EA screening shows 24-hour mean PC proportions at HR1 are less than 20% of the EQS minus twice the long-term background concentration and impacts can be screened out as insignificant.

5.2.8 Based on these predictions no unacceptable adverse impacts are associated with CO emissions.

Annual Mean TVOC (as Benzene)

Table 29 Predicted Annual Mean Benzene Concentrations

ID	Predicted Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
HR1	0.30	0.44	**5.97**	8.73
HR2	0.16	0.29	**3.13**	5.89
HR3	0.17	0.31	**3.35**	6.11
HR4	0.03	0.17	0.57	3.33
HR5	0.05	0.19	1.03	3.79
HR6	0.03	0.17	0.62	3.38
HR7	0.02	0.16	0.36	3.12

ID	Predicted Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
HR8	0.01	0.15	0.16	2.92
HR9	0.01	0.15	0.24	3.00
HR10	0.01	0.15	0.22	2.98
HR11	0.05	0.18	0.91	3.67
HR12	0.04	0.18	0.76	3.52
HR13	0.05	0.18	0.93	3.69
HR14	0.03	0.17	0.59	3.35

Predicted concentrations were assessed against annual mean EQS of 5 µg/m³.

24-hour Mean TVOC (as Benzene)

Table 30 Predicted 24-Hour Mean Benzene Concentrations

ID	Predicted Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
HR1	14.66	14.94	**48.87**	**49.32**
HR2	6.24	6.52	**20.80**	**20.99**
HR3	6.67	6.95	**22.25**	**22.45**
HR4	1.19	1.47	3.97	4.01
HR5	2.09	2.36	6.96	7.03
HR6	1.56	1.83	5.19	5.23
HR7	0.85	1.13	2.85	2.87
HR8	0.37	0.65	1.23	1.25
HR9	0.64	0.91	2.12	2.14
HR10	0.64	0.92	2.14	2.16
HR11	2.32	2.59	7.72	7.80
HR12	1.52	1.80	5.07	5.11
HR13	2.38	2.66	7.94	8.02
HR14	1.56	1.84	5.20	5.25

Predicted concentrations were assessed against 24-hour mean EQS of 30 µg/m³.

a: PEC proportion of the EQS minus twice the long-term background

5.2.9 As presented in Table 29, PC proportions of the annual mean EQS are greater than 1% at three receptor locations (HR1, HR2 and HR3). Impacts at these locations cannot be screened out as insignificant based on the initial EA screening criteria and further analysis is required. At all other locations the PC proportion of the annual mean EQS are less than 1% and impacts are screened out as insignificant

5.2.10 Proceeding with the second stage of EA screening, annual mean PEC proportions at all locations are predicted to be well below 70% of the EQS at all receptor locations and annual mean impacts can be considered insignificant.

5.2.11 As presented in Table 30, PC proportions of the 24-hour mean EQS are greater than 10% at three receptor locations (HR1, HR2 and HR3). Impacts cannot be screened out as insignificant based on the initial EA screening criteria and further analysis is required. At all other locations the PC proportion of the 24-hour EQS are less than 10% and impacts are screened out as insignificant

5.2.12 Proceeding with the second stage of EA screening, 24-hour mean PC proportions are greater than 20% of the EQS minus twice the long-term background concentration at HR1, HR2 and HR3 and impacts cannot be screened out as insignificant. However, PECs at all receptors are below 50% of the 24-hour mean EQS and given the large headroom of the PEC below the EQS the impacts are judged as acceptable and not significant.

5.2.13 Additionally, the exact composition of TVOC is unknown, as such It was assumed that all TVOC emissions consist of only benzene (C_6H_6). In reality, it is anticipated that benzene emissions would represent a much smaller proportion of the total TVOC content and therefore predictions provide an overly robust estimation.

5.2.14 Considering the above no unacceptable adverse impacts are associated with TVOC emissions.

5.3 Ecological Receptors

Annual Mean NO_x

Table 31 Predicted Annual Mean NO_x Concentrations

Receptor	Predicted Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
E1	0.01	5.99	0.02	19.96

Predicted concentrations assessed against the relevant CLV: 30 µg/m³.

24-hour Mean NO_x

Table 32 Predicted 24-Hour Mean NO_x Concentrations

Receptor	Predicted Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
E1	0.33	12.29	0.44	16.39

Predicted concentrations assessed against the relevant CLV: 75 µg/m³.

5.3.1 As presented in Table 31 and Table 32, PC proportions of the annual and 24-hour EQS are less than 1% and 10%, respectively, at all receptor locations. Impacts can be screened out as insignificant based on the initial EA screening criteria and no further analysis is required for these averaging periods.

5.3.2 Based on these predictions no unacceptable adverse ecological impacts are associated with NO_x emissions.

Annual Mean SO_2

Table 33 Predicted Annual Mean SO_2 Concentrations

Receptor	Predicted Concentration (µg/m³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
E1	0.001	0.60	0.01	6.01

Predicted concentrations assessed against the CL of 20 µg/m³

5.3.3 As presented in Table 33, PC proportions of the annual mean EQS are below 1% at all receptor locations and can be screened as insignificant based on the initial EA screening criteria.

5.3.4 Based on these predictions no adverse ecological impacts are associated with SO_2 emissions.

Nitrogen Deposition

5.3.5 Predicted annual mean nitrogen deposition rates are summarised in Table 34.

Table 34 Predicted Annual Mean Nitrogen Deposition Rates

Receptor	Predicted Deposition Rate (kgN/ha/yr)		Proportion of EQS (%)			
			Low EQS		High EQS	
	PC	PEC	PC	PEC	PC	PEC
ER1	0.00	19.70	0.04	**394.04**	0.02	**197.02**

5.3.6 As presented in Table 34, the PC proportions of the Low EQS are below 1% at all receptor locations. Analysis of the PECs indicates that CLDs are exceeded; however, this as a result of existing elevated background concentrations. Notwithstanding this, impacts can be screened out as insignificant and no further analysis is required.

5.3.7 Based on these predictions it is judged that no unacceptable adverse ecological impacts are associated with annual mean N deposition.

Acid Deposition

Table 35 Predicted Annual Mean Acid Deposition Rates

ID	Predicted Deposition Rate (keq/ha/yr)			% of Critical Load Function	
	S	N	Total	PC	PEC
E1	0.0003	0.00014	0.0005	0.11	**342.58**

5.3.8 As presented in Table 35, the PC proportion of the EQS are below 1% at all receptor locations and impacts can be screened as insignificant based on the initial EA screening criteria.

5.3.9 Based on these predictions it is judged that no unacceptable adverse ecological impacts are associated with annual mean acid deposition.

6.0 Conclusions

6.1.1 Dispersion modelling was undertaken using the ADMS 6 modelling software. Impacts at human and ecological sensitive receptors were predicted with results compared against industry significance criteria provided by the EA.

6.1.2 Impacts were based on the Facility emitting the maximum permitted pollutant concentrations, as well the use of the maximum predicted concentrations over 5 assessment years. As such, predicted concentrations are likely to be an overestimation of actual impacts.

6.1.3 Dispersion modelling of onsite combustion processes was undertaken using ADMS 6. Impacts at sensitive receptors were quantified and the results compared with the relevant EQSs and significance criteria provided by the EA. Predicted Impacts were based on operating procedures at the proposed Facility.

6.1.4 Operational impacts on human health were considered to be not significant. Where pollutants could not be screened out based on their PC being less than 1% (for long-term impacts) or 10% (for short-term impacts) of the EQS, the total PEC has been shown to be below the EQS at all modelled locations within the assessment extents.

6.1.5 On that basis, impacts on pollutant concentrations at all human locations were considered not significant.

6.1.6 NO_x and SO_2 PC proportions at ecological receptors were screened as insignificant. The CLDs for nitrogen and acid deposition were exceeded as a baseline condition at all designations however the PC proportions from the Facility were below 1% and could be screened out as insignificant using the initial EA screening criteria. Therefore, impacts at ecological designations as a result of the facility are acceptable.

6.1.7 Based on the predictions and the use of conservative assumptions, such as worse case emission limit values and meteorological conditions over a 5-year period, it is considered that the overall air quality impacts of the Facility would be insignificant.

6.1.8 In terms of air quality, the proposal is therefore considered acceptable for permitting purposes.

7.0 Abbreviations

%ile	Percentile
AAD	Ambient Air Directive
AD	Anaerobic Digestion
ADM	Atmospheric Dispersion Modelling
ADMS	Atmosphere Dispersion Modelling Software
APIS	Air Pollution Information System
AQA	Air Quality Assessment
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
AQTAG	Air Quality Technical Advisory. Group.
AW	Ancient Woodland
BAT	Best Available Techniques
C_6H_6	Benzene
CERC	Cambridge Environmental Research Consultants
CHP	Combined Heat and Power
CL	Critical Load/Level
CO	Carbon Monoxide
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EAL	Environmental Assessment Levels
ELV	Emission Limit Value
EP	Environmental Permit
EQS	Environmental Quality Standard
H_2S	Hydrogen Sulphide
LNR	Local Nature Reserve
LWS	Local Wildlife Site
MAGIC	Multi-Agency Geographic Information for the Countryside
N	Nitrogen
NGR	National Grid Reference
NNR	National Nature Reserve
NO_2	Nitrogen Dioxide
O_2	Oxygen
PC	Process Contribution
PEC	Predicted Environmental Concentration
PRV	Pressure Release Valve
S	Sulphur
SAC	Special Area of Conservation
SO_2	Sulphur Dioxide
SPA	Special Protection Area
SSSI	Site of Special Scientific Importance
TVOC	Total Volatile Organic Compounds
z_0	Roughness Length
%ile	Percentile

Appendix A - Technical Datasheets

56528R1 BRF

Technical data

800 kWel; 400 V, 50 Hz; Natural gas, MN = 80

Design conditions

Inlet air temperature / rel. Humidity:	[°C] / [%]	25 / 60
Altitude:	[m]	100
Exhaust temp. after heat exchanger:	[°C]	120
NO_x raw gas emissions genset (tolerance - 8%):	[mg/Nm^3 @5%O_2]	250

Datasheet specification considers the grid codes EU 631/2016 (NC-RfG)

Fuel gas data: 2)

Methane number:	[-]	80
Lower calorific value:	[kWh/Nm^3]	10,17
Gas density:	[kg/Nm^3]	0,79
Standard gas:	Natural gas, MN = 80	

Genset:

Engine / Configuration code:	**TCG 3016 V16**	P
Speed / Mean piston speed:	[1/min] / [m/s]	1500 / 8
Configuration / number of cylinders:	[-]	V / 16
Bore / Stroke / Displacement:	[mm]/[mm]/[dm^3]	132 / 160 / 35
Compression ratio:	[-]	13
Mean effective pressure:	[bar]	18,8
Mean lube oil consumption at full load:	[g/kWh]	0,1
Generator:	**Marelli MJB 450 MB4 or similar (*)**	
Voltage / voltage range / cos Phi:	[V] / [%] / [-]	400 / 10 / 1
Speed / frequency:	[1/min] / [Hz]	1500 / 50

*CES reserves the right to change the alternator supplier and type during offer period. The genset data may thereby change slightly.
The power output will not change. CES will confirm the alternator type, brand and alternator data sheet with the order confirmation.

Energy balance

Load:	[%]	**100**	**75**	**50**
Electrical power COP acc. ISO 8528-1:	[kW]	**800**	**600**	**400**
Engine jacket water heat:	[kW ±8%]	439	334	241
Intercooler LT heat:	[kW ±8%]	49	35	24
Lube oil heat:	[kW ±8%]			
Exhaust heat with temp. after heat exchanger:	[kW ±8%]	421	346	258
Exhaust temperature:	[°C ±25°C]	425	450	474
Exhaust mass flow | wet / dry:	[kg/h]	4530 / 4175	3430 / 3157	2371 / 2179
Combustion mass air flow:	[kg/h]	4383	3316	2291
Radiation heat engine / generator:	[kW ±8%]	29 / 24	26 / 19	24 / 16
Fuel consumption:	[kW+5%]	1888	1455	1028
Electrical / thermal efficiency:	[%]	42,4 / 45,6	41,2 / 46,7	38,9 / 48,5
Total efficiency:	[%]	88,0	87,9	87,4

System parameters 1)

Ventilation air flow (comb. air incl.) with ΔT = 15K	[kg/h]	21500
Combustion air temperature minimum / design:	[°C]	10 / 25
Exhaust back pressure from / to:	[mbar]	30 / 50
Exhaust volume flow | wet / dry:	[Nm³/h]	3539 / 3168
Maximum pressure loss in front of air cleaner:	[mbar]	5
Zero-pressure gas control unit selectable from / to: 2)	[mbar]	20 3) / 200
Pre-pressure gas control unit selectable from / to: 2)	[bar]	0,5 / 10
Starter battery 24V, capacity required:	[Ah]	286
Starter motor:	[kWel.] / [VDC]	9 / 24
Lube oil content engine & extension / clean oil tank:	[dm^3]	480 / 360*
Dry weight engine / genset:	[kg]	3236 / 8346

Cooling system

Glycol content engine jacket water / intercooler:	[% Vol.]	35 / 35
Water volume engine jacket / intercooler:	[dm^3]	56 / 5
KVS / Cv value engine jacket water / intercooler:	[m^3/h]	29 / 14
Jacket water coolant temperature in / out:	[°C]	78 / 88
Intercooler coolant temperature in / out:	[°C]	45 / 50
Engine jacket water flow rate from / to:	[m^3/h]	29 / 50
Water flow rate engine jacket water / intercooler:	[m^3/h]	40 / 10
Water pressure loss engine jacket water / intercooler:	[bar]	1,9 / 0,6
Engine jacket water pressure outlet min / max:	[bar rel.]	2 / 2,5

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1) See also "Layout of power plants":
2) See also Techn. Circular 0199-99-3017
3) Minimum pressure may be higher, depending on project conditions.
*) optional

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Frequency band f [Hz]	25	31,5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k	12.5k	16k	L_{WA} [dB(A)]	S [m^2]
Air-borne noise 4) $L_{W,Terz}$ [dB(lin)]	87,2	82,6	86,7	90,6	103,2	108,1	113,6	105,2	111,5	103,5	102,6	107,9	103,6	101,7	101,2	102,2	103,2	115,4	106,7	100,3	101,8	102,8	104,0	103,7	108,1	113,2	96,0	92,8	94,4	119,5 ±4dB(A)	76
Exhaust noise 5) $L_{W,Terz}$ [dB(lin)]	112,3	113,3	121,9	112,5	113,7	125,4	139,2	132,4	125,9	128,6	127,3	125,3	123,9	123,1	122,3	121,1	120,4	120,1	119,7	119,0	118,6	117,6	116,8	116,3	114,5	113,2	112,1	111,5	110,1	131,9 ±3dB(A)	15,2 5)

4) DIN EN ISO 3746 (σ_{R0}=±4 dB) 5) Measured in exhaust pipe (f ≤ 250Hz: ±5dB; f > 250Hz: ±3dB) L_W: Sound power level S: Area of measurement surface (S_0=1m^2) 6) DIN 45635-11, Appendix A

VIESMANN

VITOPLEX 200

Low temperature oil/gas boiler
90 to 560 kW

Datasheet

Part no. and prices: See pricelist

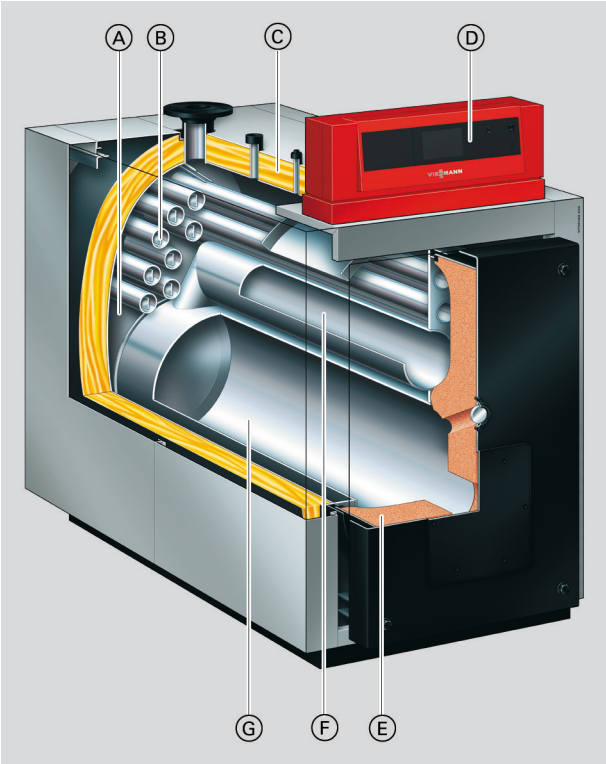
VITOPLEX 200 Type SX2A

Low temperature oil/gas boiler
- Three-pass boiler
- For operation with modulating boiler water temperature

Information for type SX2A, 90 to 350 kW:
In accordance with the Ecodesign Directive for Heating Appliances and Water Heaters (Dir. 2009/125/EC), Implementing Regulation (EU) No. 813/2013 and (EU) No. 814/2013, these boilers may not be sold and used within the EU for the purpose of generating space heating and domestic hot water. A sale is subject to the proviso of exclusive use for purposes not included in the regulations stated above.

Benefits at a glance

- Economical and environmentally responsible thanks to modulating boiler water temperature
- Standard seasonal efficiency [to DIN] for operation with fuel oil: 89 % (H_s) [gross cv]
- Optional stainless steel flue gas/water heat exchanger for higher standard seasonal efficiency [to DIN], utilising the condensing effect
- Three-pass boiler with low combustion chamber loading, resulting in clean combustion with low emissions
- Wide water galleries and large water content provide excellent natural circulation and reliable heat transfer.
- Integral Therm-Control start-up system for easy hydraulic connection – no shunt pump or return temperature raising facility are required.
- Compact design for easy handling into boiler rooms and space saving positioning – important for modernisation projects
- Fastfix installation system for control unit and thermal insulation
- Easy to use Vitotronic control unit with colour touchscreen
- Integral WiFi for service interface
- Economical and safe operation of the heating system through the Vitotronic control system with communication capability which, in conjunction with Vitogate 300 (accessories), enables integration into building management systems.
- Vitocontrol control panel can be supplied on request.



Ⓐ Wide water galleries and large water content ensure excellent natural circulation and easy hydraulic connection.
Ⓑ Hot gas flue (third pass)
Ⓒ Highly effective thermal insulation
Ⓓ Vitotronic control unit with colour touchscreen
Ⓔ Thermal insulation on boiler door
Ⓕ Hot gas flue (second pass)
Ⓖ Combustion chamber

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Boiler specification

Specification

Rated heating output	**kW**	**90**	**120**	**150**	**200**	**270**	**350**	**440**	**560**
Rated heat input	kW	98	130	163	217	293	380	478	609
CE designation									
– According to Efficiency Directive					CE-0085BQ0020			—	—
– According to Gas Appliances Directive					CE-0085BQ0020				
Permiss. flow temperature (= safety temperature)	°C				110 (up to 120 °C on request)				
Permiss. operating temperature	°C				95				
Permiss. operating pressure	bar				4				
	kPa				400				
Pressure drop on the hot gas side	Pa	60	80	100	200	180	310	280	400
	mbar	0.6	0.8	1.0	2.0	1.8	3.1	2.8	4.0
Boiler body dimensions									
Length (dim. q)*1	mm	1195	1400	1385	1580	1600	1800	1825	1970
Width (dim. d)	mm	575	575	650	650	730	730	865	865
Height (incl. connectors) (dim. t)	mm	1145	1145	1180	1180	1285	1285	1455	1455
Total dimensions									
Total length (dim. r)	mm	1260	1460	1445	1640	1660	1860	1885	2030
Total width (dim. e)	mm	755	755	825	825	905	905	1040	1040
Total height (dim. b)	mm	1315	1315	1350	1350	1460	1460	1625	1625
Service height (control unit) (dim. a)	mm	1485	1485	1520	1520	1630	1630	1795	1795
Height									
– Adjustable anti-vibration feet	mm	28	28	28	28	28	28	28	28
– Anti-vibration boiler supports (under load)	mm	–	–	–	–	–	37	37	37
Foundation									
Length	mm	1000	1200	1200	1400	1400	1650	1650	1800
Width	mm	760	760	830	830	900	900	1040	1040
Combustion chamber diameter	mm	380	380	400	400	480	480	570	570
Combustion chamber length	mm	800	1000	1000	1200	1200	1400	1400	1550
Weight of boiler body	kg	315	365	415	460	585	700	895	1100
Total weight Boiler with thermal insulation and boiler control unit	kg	360	410	465	510	635	760	960	1170
Boiler water **capacity**	Litres	180	210	255	300	400	445	600	635
Boiler connections									
Boiler flow and return	PN 6 DN	65	65	65	65	65	80	100	100
Safety connection (safety valve) (male thread)	R	1¼	1¼	1¼	1¼	1¼	1¼	1½	1½
Drain (male thread)	R				1¼				
Flue gas parameters*2 Temperature (at 60 °C boiler water temperature)									
– At rated heating output	°C				180				
– At partial load	°C				125				
Temperature (at 80 °C boiler water temperature)	°C				195				
Flue gas mass flow rate									
– With natural gas	kg/h				1.5225 x combustion output in kW				
– With EL fuel oil	kg/h				1.5 x combustion output in kW				
Flue gas connection	Ø mm	180	180	200	200	200	200	250	250
Standard seasonal efficiency [to DIN] (for operation with fuel oil) For heating system temperature 75/60 °C	%				89 (H_s) [gross cv]				
Standby loss $q_{B,70}$	%	0.40	0.35	0.30	0.30	0.25	0.25	0.22	0.20

*1 *Boiler door removed.*

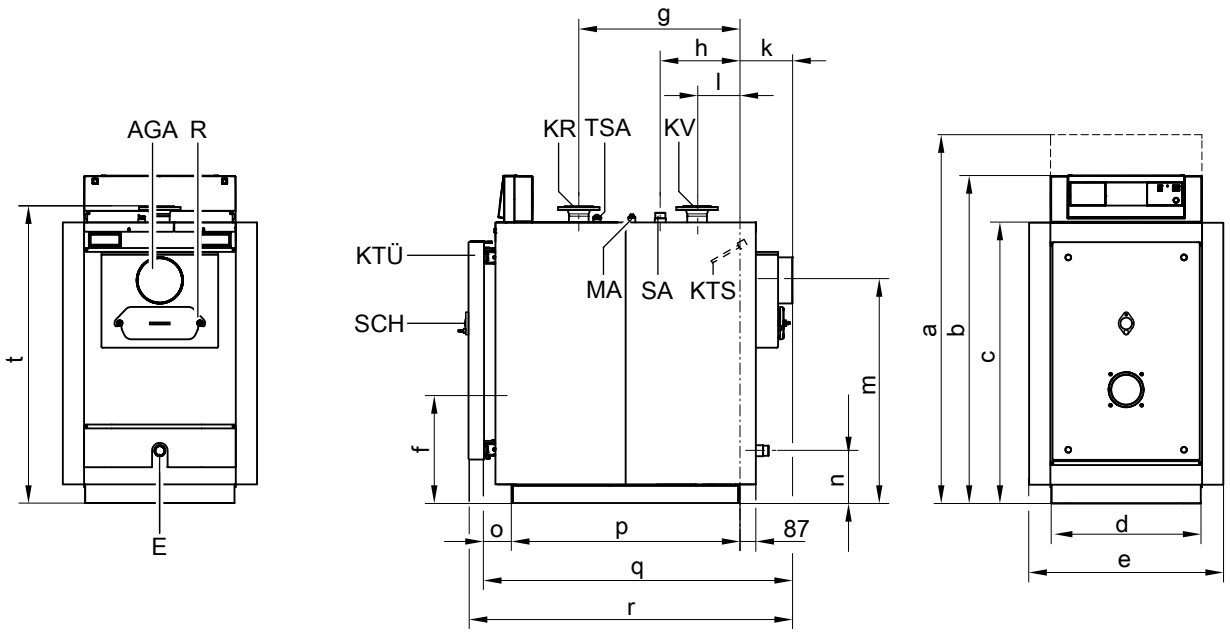
*2 *Values for calculating the size of the flue system to EN 13384, relative to 13.2 % CO_2 for EL fuel oil and 10 % CO_2 for natural gas. Flue gas temperatures as actual gross values at 20 °C combustion air temperature. The details for partial load refer to an output of 60 % of rated heating output. If the partial load differs (depending on operating mode), calculate the flue gas mass flow rate accordingly.*

5797332

Boiler specification (cont.)

Rated heating output	kW	90	120	150	200	270	350	440	560
Sound pressure level*3									
1 m in front of the boiler (stage 1/2)	dB(A)	<68/<69					–		
In the flue pipe (stage 1/2)	dB(A)	<96/<103					–		

Dimensions



90 to 270 kW

AGA Flue outlet
E Drain
KR Boiler return
KTS Boiler water temperature sensor
KTÜ Boiler door
KV Boiler flow
MA Female connection R ½ (male thread) for pressure gauge
R Cleaning aperture
SA Safety connection (safety valve)
SCH Inspection port
TSA Female connection R ½ (male thread) for Therm-Control temperature sensor

*3 *Standard values resulting from sound pressure level testing cannot be guaranteed, as sound pressure level tests are always dependent on the specific system. The data provided here refers to Viessmann Vitoflame 100 pressure-jet oil/gas burners.*

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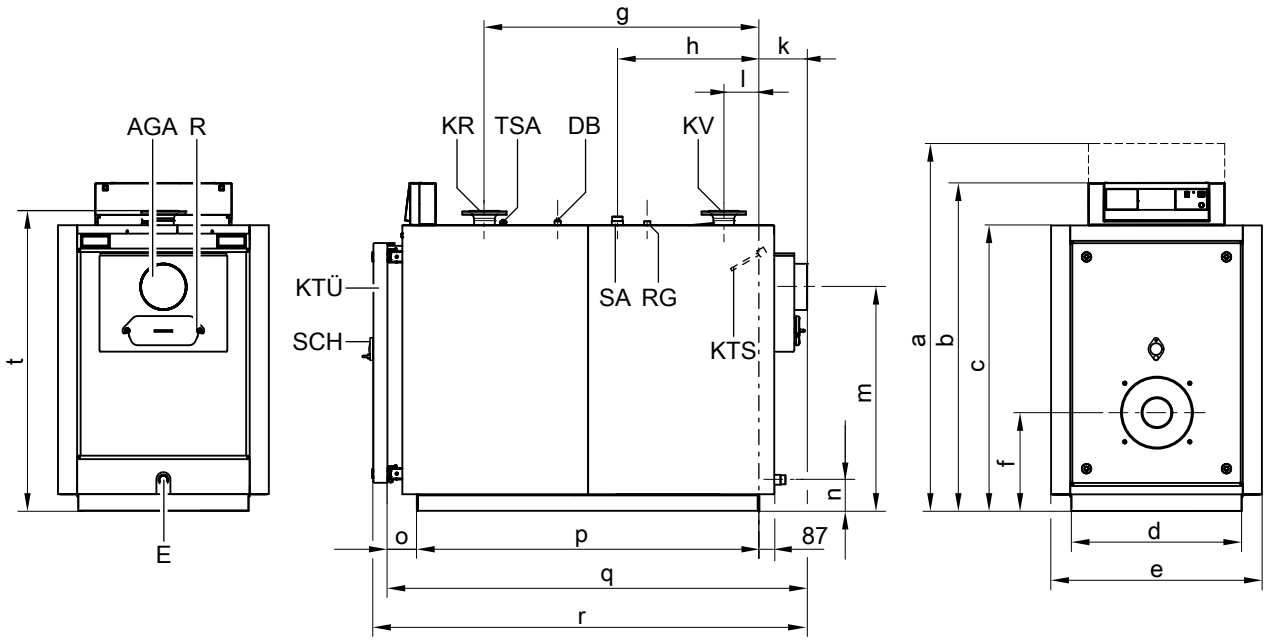
Boiler specification (cont.)



350 to 560 kW

AGA Flue outlet
DB Female connection R ½ (male thread) for maximum pressure limiter
E Drain
KR Boiler return
KTS Boiler water temperature sensor
KTÜ Boiler door
KV Boiler flow
R Cleaning aperture
RG Female connection R ½ (male thread) for additional control equipment
SA Safety connection (safety valve)
SCH Inspection port
TSA Female connection R ½ (male thread) for Therm-Control temperature sensor

Table of dimensions

Rated heating output	kW	90	120	150	200	270	350	440	560
a	mm	1485	1485	1520	1520	1630	1630	1795	1795
b	mm	1315	1315	1350	1350	1460	1460	1625	1625
c	mm	1085	1085	1115	1115	1225	1225	1395	1395
d	mm	575	575	650	650	730	730	865	865
e	mm	755	755	825	825	905	905	1040	1040
f	mm	440	440	440	440	420	420	470	470
g	mm	622	825	811	1009	979	1179	1146	1292
h	mm	307	395	324	423	409	609	710	783
k	mm	203	203	203	203	203	203	224	224
l	mm	165	165	151	151	153	153	166	166
m	mm	860	860	885	885	960	960	1110	1110
n	mm	200	200	190	190	135	135	135	135
o	mm	110	110	110	110	130	130	130	130
p (length of base rails)	mm	882	1085	1071	1268	1269	1469	1471	1617
q (handling dimension)	mm	1195	1400	1385	1580	1600	1800	1825	1970
r	mm	1260	1460	1445	1640	1660	1860	1885	2030
t	mm	1145	1145	1180	1180	1285	1285	1455	1455

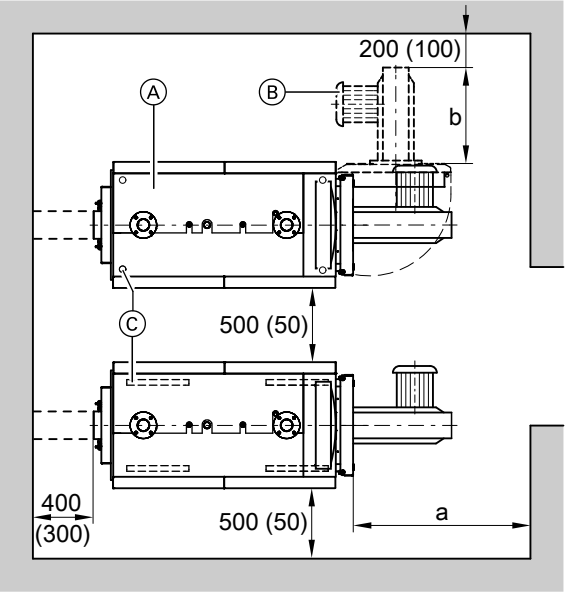
Where access to the boiler room is difficult, the boiler door can be removed.
Dim. f: Observe the installed burner height.
Dim. q: With boiler door removed

5797332

Boiler specification (cont.)

Siting

Minimum clearances



Observe the stated dimensions to ensure straightforward installation and maintenance. Where space is tight, only the minimum clearances (dimensions in brackets) need to be maintained. In the delivered condition, the boiler door is fitted so it opens to the left. The hinge pins can be repositioned so the door opens to the right.

Ⓐ Boiler
Ⓑ Burner
Ⓒ Adjustable anti-vibration feet or anti-vibration boiler supports (350 to 560 kW)

Rated heating output	kW	90	120	150	200	270	350	440	560
a	mm	1100			1400		1600		

Dim. a: Maintain this space in front of the boiler to enable removal of the turbulators and cleaning of the hot gas flues.
Dim. b: Observe the installed burner length.

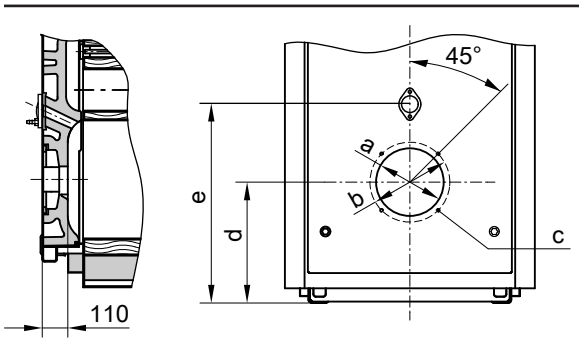
Siting conditions

- Prevent air contamination by halogenated hydrocarbons (e.g. as contained in sprays, paints, solvents and cleaning agents)
- Prevent very dusty conditions
- Prevent high levels of humidity
- Prevent frost and ensure good ventilation

Otherwise the system may suffer faults and damage.
In rooms where air contamination through **halogenated hydrocarbons** may occur, install the boiler only if adequate measures can be taken to provide a supply of uncontaminated combustion air.

Burner installation

Boilers up to 120 kW:
The burner fixing hole circle, burner fixing holes and flame tube aperture comply with EN 226.
Boilers from 150 kW:
The burner fixing hole circle, burner fixing holes and flame tube aperture are as detailed in the table below.
The burner can be fitted directly to the hinged boiler door. If the burner dimensions deviate from those stated in the table below, use the burner plate included in the standard delivery.
Burner plates can be prepared at the factory on request (chargeable option). If this is required, state the burner make and type when ordering. The flame tube must protrude from the thermal insulation of the boiler door.



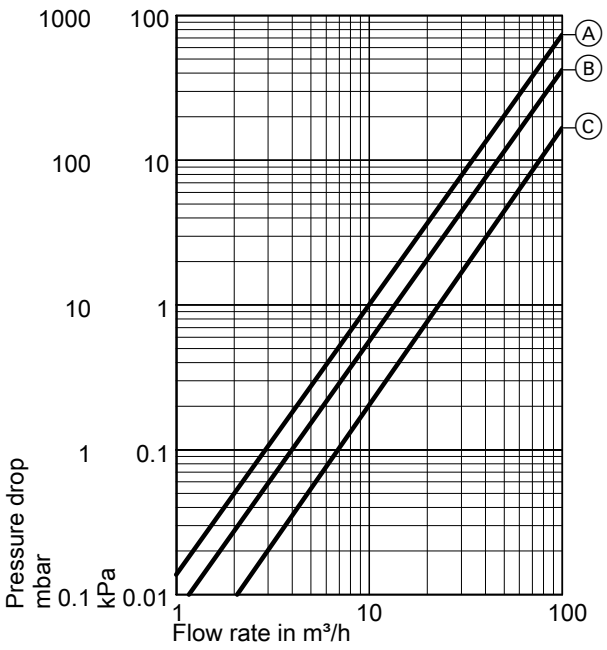
Rated heating output	kW	90	120	150	200	270	350	440	560
a	Ø mm	135	135	240	240	240	240	290	290
b	Ø mm	170	170	270	270	270	270	330	330
c	Quantity/thread	4/M 8	4/M 8	4/M 10	4/M 10	4/M 10	4/M 10	4/M 12	4/M 12

5797332

Boiler specification (cont.)

Rated heating output	kW	90	120	150	200	270	350	440	560
d	mm	440	440	440	440	420	420	470	470
e	mm	650	650	650	650	670	670	780	780

Pressure drop on the heating water side



The Vitoplex 200 is only suitable for fully pumped hot water heating systems.

Ⓐ Rated heating output 90 to 270 kW
Ⓑ Rated heating output 350 kW
Ⓒ Rated heating output 440 and 560 kW

Delivered condition of the boiler

Boiler shell with fitted boiler door and cleaning cover
Mating flanges are fitted to all connectors.
The adjusting screws are supplied in the combustion chamber.
Cleaning equipment can be found on top of the boiler.

2 Box with thermal insulation
1 Box with boiler control unit and 1 bag with technical documentation
1 Therm-Control
1 Coding card and technical documentation for Vitoplex 200
1 Burner plate (from 150 kW)

Control unit versions

For a single boiler system

- **Vitotronic 100, type CC1E**
  For the control unit with a constant boiler water temperature.
  For weather-compensated or room temperature-dependent operation in conjunction with an external control unit.
- **Vitotronic 200, type CO1E**
  For weather-compensated operation and mixer control for up to 2 heating circuits with mixer. For the 2 heating circuits with mixer, the accessory "Extension for heating circuits 2 and 3" is required.

Control unit versions (cont.)

For a multi boiler system (up to 8 boilers)

- **Vitotronic 300, type CM1E**
  For weather-compensated operation of a multi boiler system. This Vitotronic control unit also handles control of the boiler water temperature of a boiler within this multi boiler system.
  Vitotronic 100, type CC1E and LON communication module
  To control the boiler water temperature for each additional boiler in the multi boiler system.
- **Vitocontrol 100-M/200-M multi mode system controller**
  For weather-compensated cascade control of boilers with Vitotronic 100 control unit and a Vitobloc 200 CHP unit or other heat generator.

Multi mode system controller in the control panel

For single and multi boiler systems

Vitocontrol 100-M

- For operation of multi mode heating systems with up to 4 heat generators, with various combinations of oil/gas boilers, heat pumps, CHP units and solid fuel boilers. The Vitocontrol 100-M can operate a range of defined standard schemes. The schemes are available via the Viessmann Schematic Browser. For the compatibility of the Vitocontrol 100-M in conjunction with Viessmann control units, see the compatibility list. Connection to ViScada for web-based system visualisation is available as an option. This requires an internet connection.
  Viessmann Schematic Browser: **www.viessmann-schemes.com**
  Compatibility list: **www.vitocontrol.info**

Vitocontrol 200-M

- For the operation of customer-specific multi mode energy systems with any number of heat generators in various combinations, as well as cooling, solar, ventilation and electricity components. Solutions are based on a modular system and can be flexibly extended with new functions and process applications. Connection to ViScada for web-based system visualisation is available as an option. This requires an internet connection.

Boiler accessories

See pricelist.

Operating conditions for systems with Vitotronic boiler protection

Vitotronic boiler protection, e.g. Therm-Control.

		Requirements	
Operation with burner load		**≥ 60 %**	**< 60 %**
1.	Heating water flow rate	None	
2.	Boiler return temperature (minimum value)*4	None*5	
3.	Lower boiler water temperature	– Oil operation 50 °C – Gas operation 60 °C	– Oil operation 60 °C – Gas operation 65 °C
4.	2-stage burner operation	1st stage 60 % of rated heating output	No minimum load required
5.	Modulating burner operation	Between 60 and 100 % of rated heating output	No minimum load required
6.	Reduced mode	Single boiler systems and lead boiler in multi boiler systems – Operation with lower boiler water temperature Lag boilers in multi boiler systems – Can be shut down	
7.	Weekend setback	As per reduced mode	

For water quality requirements see the technical guide to this boiler.

*4 *For a corresponding sample system for using the Therm-Control start-up system, see the Viessmann schematic browser at* ***www.viessmann-schemes.com***

*5 *No requirements; only in conjunction with Therm-Control.*

5797332

Operating conditions for systems with on-site boiler protection

		Requirements	
Operation with burner load		**≥ 60 %**	**< 60 %**
1.	Heating water flow rate	None	
2.	Boiler return temperature (minimum value)	– Oil operation 40 °C – Gas operation 53 °C	– Oil operation 53 °C – Gas operation 58 °C
3.	Lower boiler water temperature	– Oil operation 50 °C – Gas operation 60 °C	– Oil operation 60 °C – Gas operation 65 °C
4.	2-stage burner operation	1st stage 60 % of rated heating output	No minimum load required
5.	Modulating burner operation	Between 60 and 100 % of rated heating output	No minimum load required
6.	Reduced mode	Single boiler systems and lead boiler in multi boiler systems – Operation with lower boiler water temperature Lag boilers in multi boiler systems – Can be shut down	
7.	Weekend setback	As per reduced mode	

For water quality requirements see the technical guide to this boiler.

Design information

Installing a suitable burner

The burner must be suitable for the relevant rated heating output and the boiler pressure drop on the hot gas side (see the burner manufacturer's specification).
The material of the burner head must be suitable for operating temperatures up to at least 500 °C.

Pressure-jet oil burner
The burner must be tested and designated to EN 267.

Pressure-jet gas burner
The burner must be tested to EN 676 and be identified with the CE designation.

Burner adjustment
Adjust the oil or gas throughput of the burner to suit the rated boiler heating output.

Low water indicator

If the standard boiler control unit is connected in accordance with the installation instructions, the Vitoplex 200 up to 300 kW (except in attic heating centres) does not require a low water indicator to EN 12828.

In the event of a water shortage due to a leak in the heating system and simultaneous burner operation, the control unit will automatically shut down the burner before the boiler and/or flue system reach impermissible high temperatures.

Permissible flow temperatures

Hot water boiler for permissible flow temperatures (= safety temperatures)

Up to 110 °C
- **CE designation:**
  CE-0085 (90 to 350 kW) compliant with Efficiency Directive
  and
  CE-0085 compliant with the Gas Appliances Directive

Above 110 °C (up to 120 °C) (with individual test certification on request)
- **CE designation:**
  CE-0035 in compliance with the Pressure Equipment Directive
  For operation with safety temperatures in excess of 110 °C additional safety equipment is required.
  Boilers with a safety temperature **above 110 °C** require supervision, according to the Health & Safety at Work Act [Germany]. In accordance with the conformity assessment diagram no. 5 of the EU Pressure Equipment Directive, these boilers must be classed as category III.
  The system must be tested prior to commissioning.
  – Annually: External inspection, inspection of the safety equipment and water quality.
  – Every 3 years: Internal inspection (or water pressure test as an alternative).
  – Every 9 years: Water pressure test (for max. test pressure see type plate).
  An approved inspection body (e.g. TÜV [in Germany]) must carry out the test.

Further information on design/engineering

See the technical guide to this boiler.

Tested quality

CE designation according to current EC Directives

Subject to technical modifications.

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E-mail: info-uk@viessmann.com

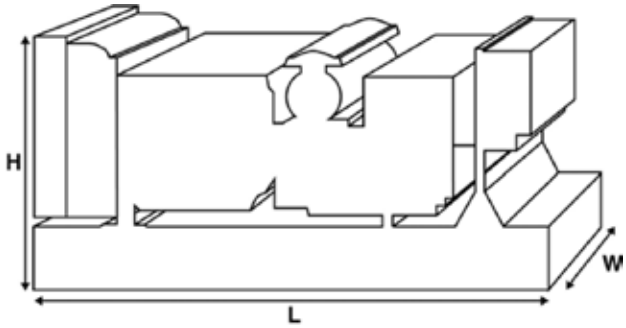
5797332

P200-3_50Hz

Output Ratings

Voltage, Frequency		Prime	Standby
400/230 V, 50 Hz	kVA	180	200
	kW	144	160
	kVA		
	kW		

Ratings at 0.8 power factor.
Please refer to the output ratings technical data section for specific generator set outputs per voltage.



Dimensions and Weights

Length	mm	2510 (98.8)
Width	mm	1010 (39.8)
Height	mm	1640 (64.6)
Weight (Dry)	kg	1521 (3353)
Weight (Wet)	kg	1548 (3413)

Ratings in accordance with ISO 8528, ISO 3046, IEC 60034, BS5000 and NEMA MG-1.22.
Generator set pictured may include optional accessories.

Prime Rating

These ratings are applicable for supplying continuous electrical power (at variable load) in lieu of commercially purchased power. There is no limitation to the annual hours of operation and this model can supply 10% overload power for 1 hour in 12 hours.

Standby Rating

These ratings are applicable for supplying continuous electrical power (at variable load) in the event of a utility power failure. No overload is permitted on these ratings. The alternator on this model is peak continuous rated (as defined in ISO 8528-3).

Standard Reference Conditions

Note: Standard reference conditions 25°C (77°F) Air Inlet Temp, 100m (328 ft) A.S.L. 30% relative humidity.
Fuel consumption data at full load with diesel fuel with specific gravity of 0.85 and conforming to BS2869: 1998, Class A2.

FG Wilson offer a range of optional features to allow you to tailor our generator sets to meet your power needs.
Options available include:

- Upgrade to CE Certification
- A wide range of Sound Attenuated Enclosures
- A variety of generator set control and synchronising panels
- Additional alarms and shutdowns
- A selection of exhaust silencer noise levels

For further information on all of the standard and optional features accompanying this product please contact your local Dealer or visit:

www.fgwilson.com

P200-3_50Hz

Ratings and Performance Data

Engine Make		Perkins	
Engine Model:		1106A-70TAG3	
Alternator Make		FG Wilson	
Alternator Model:		FGL30120	
Control Panel:		FG100	
Base Frame:		Heavy Duty Fabricated Steel	
Circuit Breaker Type:		3 Pole MCCB	
Frequency:		50 HZ	60 HZ
Engine Speed: RPM	rpm	1500	1800
Fuel Tank Capacity:	litres (US gal)	394 (104.08)	
Fuel Consumption Prime	litres (US gal)/hr	39.8 (10.5)	
Fuel Consumption Standby	litres (US gal)/hr	43.2 (11.4)	

Engine Technical Data

No. of Cylinders		6
Alignment		IN LINE
Cycle		4 STROKE
Bore	mm (in)	105 (4.1)
Stroke	mm (in)	135 (5.3)
Induction		TURBOCHARGED AIR TO AIR CHARGE COOLED
Cooling Method		WATER
Governing Type		MECHANICAL
Governing Class		ISO 8528 G2
Compression Ratio		16.0:1
Displacement	L (cu. in)	7 (427.8)
Moment of Inertia:	kg m^2 (lb/in^2)	1.26 (4306)
Voltage		12
Ground		Negative
Battery Charger Amps		85
Engine Weight Dry	kg (lb)	788 (1737)
Engine Weight Wet	kg (lb)	822 (1812)

Engine Performance Data		50 Hz	60 Hz
Engine Speed	rpm	1500	1800
Gross Engine Power Prime	kW (hp)	162.7 (218)	180.5 (242)
Gross Engine Power Standby	kW (hp)	180.2 (242)	199.7 (268)
BMEP Prime	kPa (psi)	1856 (269.2)	1715 (248.8)
BMEP Standby	kPa (psi)	2055 (298.1)	1898 (275.3)

P200-3_50Hz

Fuel System

Fuel Filter Type:			Replaceable Element		
Recommended Fuel:			Class A2 Diesel		
Fuel Consumption at		110 % Load	100 % Load	75 % Load	50 % Load
50 Hz Prime:	l/hr (US gal/hr)	43.2 (11.4)	39.8 (10.5)	30.7 (8.1)	19.6 (5.2)
50 Hz Standby	l/hr (US gal/hr)	-	43.2 (11.4)	33.9 (9)	22.2 (5.9)
60 Hz Prime	l/hr (US gal/hr)				
60 Hz Standby	l/hr (US gal/hr)	-			

(Based on diesel fuel with a specific gravity of 0.85 and conforming to BS2869 classA2,EN590

Air System		50 Hz	60 Hz
Air Filter Type:		Paper Element	
Combustion Air Flow Prime	m^3/min (cfm)	12.7 (448)	
Combustion Air Flow Standby	m^3/min (cfm)	13.5 (477)	
Max. Combustion Air Intake Restriction	kPa	5 (20.1)	

Cooling System		50 Hz	60 Hz
Cooling System Capacity	l (US gal)	27 (7.1)	
Water Pump Type:		Centrifugal	
Heat Rejected to Water & Lube Oil: Prime	kW (Btu/min)	71.9 (4089)	
Heat Rejected to Water & Lube Oil: Standby	kW (Btu/min)	77.9 (4430)	
Heat Radiation to Room*: Prime	kW (Btu/min)	23 (1308)	
Heat Radiation to Room*: Standby	kW (Btu/min)	25.2 (1433)	
Radiator Fan Load:	kW (hp)	5 (6.7)	
Radiator Cooling Airflow:	m^3/min (cfm)	307.2 (10849)	
External Restriction to Cooling Airflow:	Pa (in H2O)	125 (0.5)	

*: Heat radiated from engine and alternator
Designed to operate in ambient conditions up to 50°C (122°F).
Contact your local FG Wilson Dealer for power ratings at specific site conditions.

Lubrication System

Oil Filter Type:		Spin-on, Full flow
Total Oil Capacity:	l (US gal)	16.5 (4.4)
Oil Pan Capacity:	l (US gal)	14.9 (3.9)
Oil Type:		API CH4 / CI4 15W-40
Oil Cooling Method:		WATER

Exhaust System		50 Hz	60 Hz
Maximum Allowable Back Pressure:	kPa (in Hg)	6 (1.8)	
Exhaust Gas Flow: Prime	m^3/min (cfm)	30.4 (1073)	
Exhaust Gas Flow: Standby	m^3/min (cfm)	32.3 (1140)	
Exhaust Gas Temperature: Prime	°C (°F)	487 (909)	
Exhaust Gas Temperature: Standby	°C (°F)	487 (909)	

P200-3_50Hz

Alternator Physical Data

No. of Bearings:	1
Insulation Class:	H
Winding Pitch:	2/3
Winding Code	6P/6S
Wires:	4
Ingress Protection Rating:	IP23
Excitation System:	SHUNT
AVR Model:	R120

* dependant on voltage code selected

Alternator Operating Data

Overspeed: rpm		2250
Voltage Regulation: (Steady state)	%	+/- 0.5
Wave Form NEMA = TIF:		50
Wave Form IEC = THF:	%	2
Total Harmonic content LL/LN:	%	2
Radio Interference:		EN61000-6
Radiant Heat: 50 Hz	kW (Btu/min)	12.2 (694)
Radiant Heat: 60 Hz	kW (Btu/min)	0 ()

Alternator Performance Data 50 Hz:

Voltage Code		415/240 V	400/230 V	380/220 V	220/127 V
			200/115 V		
Motor Starting Capability*	kVA	328	307	280	364
Short Circuit Capacity**	%	270	270	270	270
Reactances	Xd	3.19	3.44	3.809	2.84
	X'd	0.158	0.17	0.188	0.14
	X"d	0.102	0.102	0.113	0.084

Alternator Performance Data 60 Hz

Voltage Code						
Motor Starting Capability*	kVA					
Short Circuit Capacity**	%	270	270	270	270	270
Reactances	Xd					
	X'd					
	X"d					

Reactances shown are applicable to prime ratings.

*Based on 30% voltage dip at 0.6 power factor.

** With optional independant excitation system (PMG / AUX winding)

P200-3_50Hz

Output Ratings 50 Hz

	Prime		Standby	
Voltage Code	kVA	kW	kVA	kW
415/240V	180	144	200	160
400/230V	180	144	200	160
380/220V	180	144	200	160
230/115V	180	144	200	160
220/127V	180	144	200	160
220/110V	180	144	200	160
200/115V	180	144	200	160
240V				
230V				
220V				

Output Ratings 60 Hz

	Prime		Standby	
Voltage Code	kVA	kW	kVA	kW
480/277V				
440/254V				
416/240V				
400/230V				
380/220V				
240/139V				
240/120V				
230/115V				
220/127V				
220/110V				
208/120V				
240/120				
220/110				

P200-3_50Hz

Dealer Contact Details

STUART GROUP LTD

Stuart Group Ltd
Stuart House, Hargham Road
Shropham, NR17 1DT
t: +44 (0) 1953 454540
e: powersales@stuartgroup.ltd.uk
w: www.stuartgroup.ltd.uk

PROVIDING VALUABLE POWER SERVICES SINCE 1982

Documentation

Operation and maintenance manual including circuit wiring diagrams.

Generator Set Standards

The equipment meets the following standards: BS5000, ISO 8528, ISO 3046, IEC 60034, NEMA MG-1.22.

Warranty

6.8 – 750 kVA electric power generation products in prime applications the warranty period is 12 months from date of start-up, unlimited hours (8760). For standby applications the warranty period is 24 months from date of start-up, limited to 500 hours per year.

730 – 2500 kVA electric power generation products in prime applications the warranty period is 12 months from date of start-up, unlimited hours (8760 hours) or 24 months from date of start-up, limited to 6000 hours. For standby applications the warranty period is 36 months from date of start-up, limited to 500 hours per year.

FG Wilson manufactures product in the following locations:
Northern Ireland • Brazil • China • India
With headquarters in Northern Ireland, FG Wilson operates through a Global Dealer Network.
To contact your local Sales Office please visit the FG Wilson website at www.fgwilson.com.

FG Wilson is a trading name of Caterpillar (NI) Limited.

Appendix E – Odour Risk Assessment

enzygo
environmental consultants

Odour Impact Assessment

Brains Farm, Wincanton, Anaerobic Digestion Plant

Japan Environmental Development & Investment UK Limited

CRM.0169.001.OD.R.001

'Experience and expertise working in union'

enzygo.com

Contact Details:

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Odour Assessment - CRM.0169.001.OD.R.001

Project:	Brains Farm, Wincanton, Anaerobic Digestion Plant
For:	Japan Environmental Development & Investment UK Limited
Status:	Final
Date:	March 2024
Author:	Josh Davies BSc (Hons) – Principal Air Quality Consultant
Reviewer:	Conal Kearney BEng (Hons) MSc MIAQM MIEnvSc – Director of Air Quality

Contents

1.0 Introduction 4
1.1 Background 4
1.2 Site Location and Context 4
1.3 Facility Operations 5
2.0 Legislation Guidance and Policy 8
2.1 Guidance 8
2.2 Odour Benchmark Levels 8
2.3 Institute of Air Quality Management Guidance 9
3.0 Dispersion Modelling Inputs 10
3.1 Scope 10
3.2 Process Description and Potential Odour Sources 10
3.3 Dispersion Modelling 11
3.4 Modelling Scenarios and Emissions 11
3.5 Time Varied Emissions 15
3.6 Assessment Extents 15
3.7 Terrain Data 17
3.8 Building Effects 17
3.9 Meteorological Data 18
3.10 Roughness Length 19
3.11 Monin-Obukhov Length 19
3.12 Surface Albedo and Priestley-Taylor Parameter 19
3.13 Significance of Odour Impacts 19
3.14 Modelling Uncertainties 20
3.15 Dispersion Modelling Report Requirements 21
4.0 Assessment 22
4.1 Sensitive Receptor Results 22

4.2 IAQM Guidance Impact Significance 22
5.0 Conclusions 24
6.0 Abbreviations 25

Tables and Figures

Figure 1: Modelled Sensitive Receptor Locations 5
Table 1: Proposed Feedstocks and Annual Throughputs 5
Figure 2: ADMS-6 Model Layout 7
Table 2: Odour Benchmark Levels 8
Table 3: Odour Receptor Sensitivity 9
Table 4: Dispersion Modelling Scenarios 11
Table 5: Odour Emission Rates 11
Table 6: Emissions 13
Table 7: Human Sensitive Receptors 16
Figure 3: Modelled Sensitive Receptor Locations 17
Table 8: Building Geometries 17
Figure 5: Meteorological Wind Roses 19
Table 9 Utilised Roughness Length 19
Table 10 Utilised Monin-Obukhov Lengths 19
Table 12 Dispersion Modelling Report Requirements 21
Table 13 Predicted Odour Concentrations 22
Table 14 Predicted Impact Significance at Receptors 22
Figure 6: Maximum 5-year Odour Concentrations 23

Non-Technical Summary

i. Enzygo Limited was commissioned by Japan Environmental Development and Investment UK Limited to undertake odour dispersion modelling to support a permit application relating to an anaerobic digestion facility located at Brains Farm, Moor Lane, Wincanton.

ii. The operation of the plant has potential to cause odour impacts at sensitive locations due to onsite odour sources associated the storage and processing of feedstocks and digestate. Odour dispersion modelling was undertaken to consider impacts at existing sensitive receptor locations in the vicinity of the site.

iii. Odour emissions were defined based on the proposed plant operations and a review of literature and emission profiles used at similar facilities. Where necessary, robust assumptions were applied.

iv. Impacts at sensitive receptor locations in the vicinity of the site were quantified, with results compared with the appropriate odour benchmark level.

v. Predicted maximum odour concentrations were below the appropriate benchmark level at all sensitive receptors in the vicinity of the site for all modelling years. In addition, using the IAQM guidance significance criteria, impacts based on conservative modelling assumptions were slight at three receptor locations and negligible at all other receptors and overall impacts are considered as not significant.

vi. Based on the modelling results and conservative assumptions made, overall potential for odour impacts generated by the AD facility can be considered as not significant.

vii. Additionally, the facility will also control and prevent odour emissions in accordance with an Odour Management Plan. As such, the operation of the facility will not lead to an unacceptable impact on local amenity with regard to odour.

1.0 Introduction

1.1 Background

1.1.1 Enzygo Limited (Ltd) was commissioned by Japan Environmental Development & Investment (JEDI) UK Ltd to undertake detailed odour dispersion modelling to support a bespoke environmental permit application for a proposed anaerobic digestion (AD) plant at Brains Farm, Wincanton (the 'Facility').

1.1.2 The facility will process approximately 50,000 tonnes per annum (tpa) of feedstock materials comprising non-waste energy crops. Specifically this will comprise maize, grass and straw and manure, including broiler and layer litter, pig and cattle manure mixed with straw, alongside vegetable and fruit wastes. The Facility will produce digestate and biogas which will be upgraded and injected into the medium pressure gas mains or utilised in the auxiliary biogas boiler.

1.1.3 During the operation of the Facility there is potential for impacts to occur at existing sensitive receptors as a result of fugitive odour releases from the Facility. Odour dispersion modelling was therefore undertaken to consider impacts in the vicinity of the site.

1.2 Site Location and Context

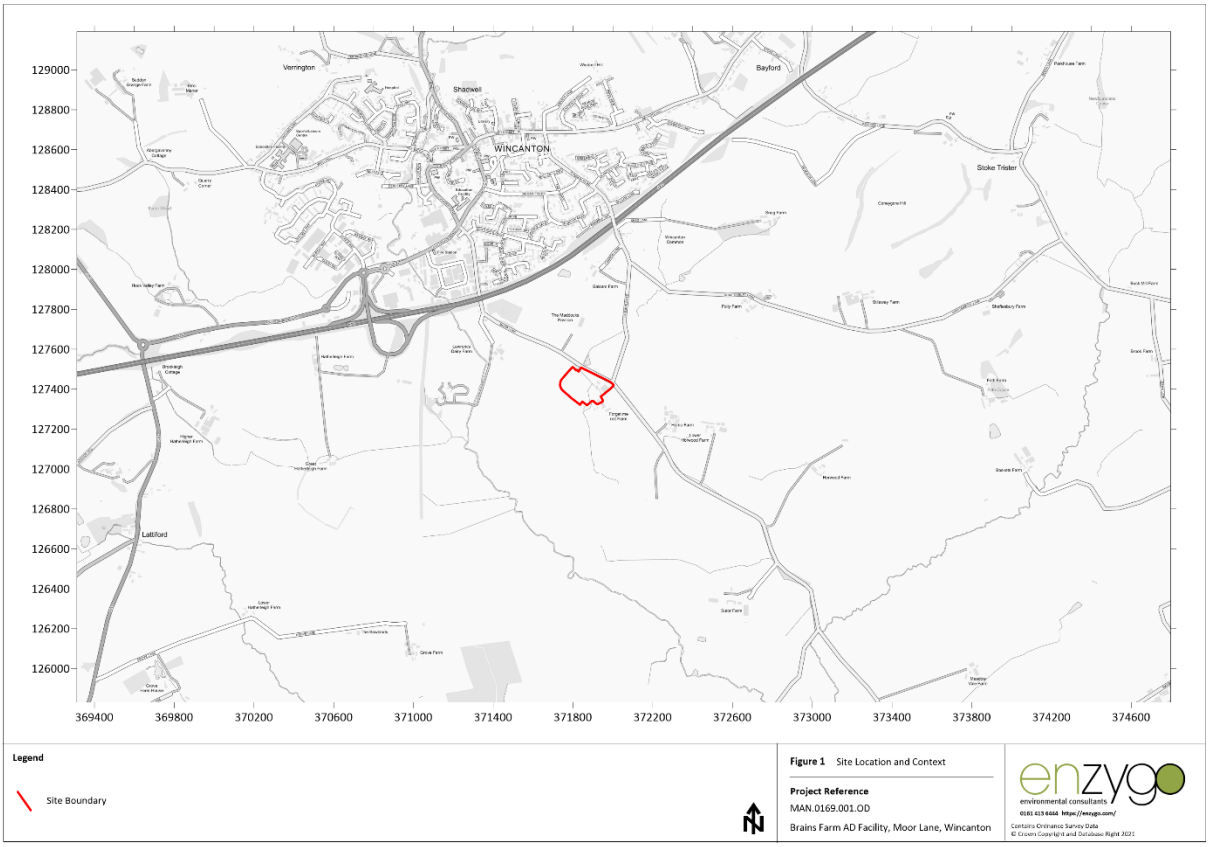
1.2.1 The Facility is located to the south of Wincanton on land at Land at Brains Farm, Moor Lane, Wincanton Somerset, BA9 9DP at the approximate National Grid Reference (NGR): 371860, 127420 situated approximately 550 m north west of the town of Wincanton.

1.2.2 The site currently comprises a combination of arable agricultural land, agricultural buildings, a residential property, concrete hardstanding, and drainage ditches. The site is bound by Moor Lane to the north with a pond, recreational sports fields, and tennis courts beyond. The site is also bound by Moor Lane to the East with agricultural fields beyond the road. The south and west of the site is bound by agricultural fields.

1.2.3 The site is surrounded by agricultural areas with sparsely distributed working farms and residential properties in the vicinity of the site. The nearest residential property is Forget me Not Farm situated adjacent to the south east boundary of the Facility.

1.2.4 Reference should be made to Figure 3 for a graphical representation of the site location.

Figure 1: Site Location



1.3 Facility Operations

1.3.1 The proposed Facility will operate an AD process fuelled by biomass feedstock in form of energy crops, farmyard manures (FYM) and vegetable and fruit wastes. The majority of the biogas produced by the AD process will be upgraded for injection into the gas grid.

1.3.2 The annual mass of waste types to be processed at the Facility are summarised in Table 1

Table 1: Proposed Feedstocks and Annual Throughputs

Feedstock	Annual Quantity in Tonnes
Maize	15,750
Grass	4,750
Whole Crop Silage	2,850
Broiler and Layer Manure	10,000
Straw Mixed Pig and Cattle Manure	7,500
Vegetable and Fruit Waste	2,750
Straw	4,500
Top Bales of Straw	1,900
Liquid Digestate	26,650
Solid Digestate	20,810

1.3.3 The AD process can briefly be described as follows:

Feedstock

1.3.4 The site will operate using biomass feedstock in the form of non-waste energy crops (maize, whole crop), grass, straw, FYM (poultry, pig, and cattle), and vegetable and fruit wastes. The

crops will be transported to site between May and October and ensiled within two silage clamps. FYM and vegetable/fruit waste is delivered on a daily basis throughout the year and will be sheeted and stored on a concrete pad adjacent to the silage clamps.

1.3.5 The silage, FYM, poultry litter, and vegetable/fruit waste feedstocks will be covered at all times, unless during loading and unloading, using protective sheeting. This will form an airtight layer to minimise emissions to preserve the feedstocks during storage. During loading in to the AD process the feedstocks will be exposed at one end, closest to the feeding hoppers, to allow access to the feedstock for transportation. Once material is loaded into the feeder hoppers the feedstock is re-covered.

Operation

1.3.6 All feedstock material will be fed into the primary digester, then secondary digester which are sealed and fitted with vents. The biogas produced (a mixture of methane (CH_4) and carbon dioxide (CO_2)) will be stored prior to upgrade for export to the grid or use in biogas boiler where it will be combusted to provide supplementary heat to the facility. A Combined Heat and Power (CHP) unit is also proposed, which will utilise natural gas as a fuel and provide heat and power to the process.

1.3.7 A flare and backup diesel generator are also proposed at the Facility for emergency venting of biogas during abnormal operation and as a backup heat supply when the CHP/biogas boiler are not operating.

Digestate

1.3.8 Digestate will undergo a pasteurisation process on site to remove pathogens to ensure the material suitable for application to land. Following this the digestate will be separated into “solid” and “liquid” fractions.

1.3.9 The solid fraction is stored underneath the separator before removal by tractor/trailer for use as a fertilizer via Heavy Good Vehicle (HGV)/tractor and trailer. The liquid fraction of the digestate is either stored within the onsite lagoon before being transported off-site via tanker for use as a fertiliser on local agricultural land or recirculated into the AD process.

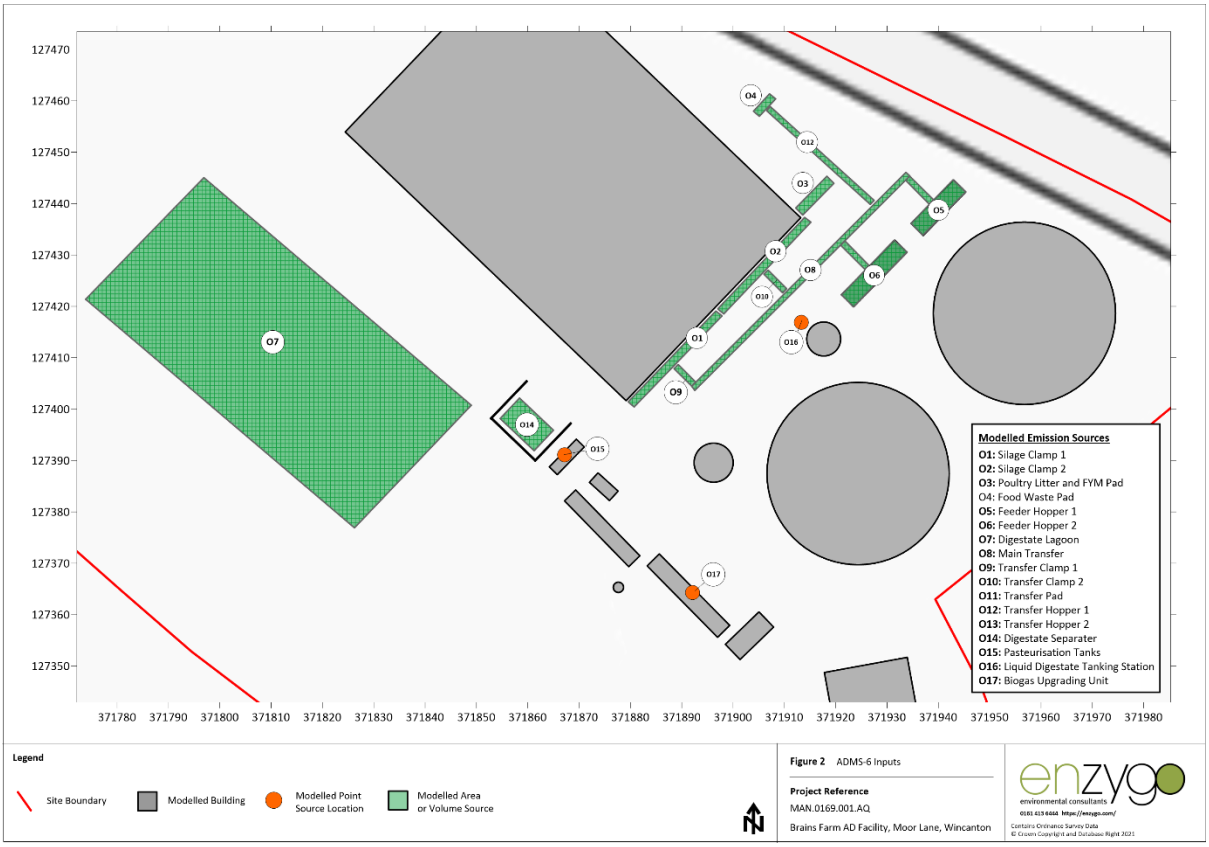
1.3.10 The biogas which is produced during the digestion process is either directed to the biogas upgrading unit or for combustion via the biogas boiler which generates electricity and heat to be used at the site. The biogas which is sent to the upgrading unit is treated to remove contaminants and tested for conformity before being injected into the grid.

1.3.11 The activities associated with the proposed plant are controlled under the Environmental Permitting (England and Wales) Regulations (2016) and subsequent amendments. As such, the operator will be required to obtain an Environmental Permit from the Environment Agency (EA) as the appropriate regulator prior to operation.

1.3.12 The operation of the plant may result in odour emissions from a number of activities. These have the potential to cause impacts at sensitive locations within the vicinity of the site and have therefore been assessed within this report. shows a site layout plan and identification of modelled odour sources.

1.3.13 Reference should be made to Figure 2 for a graphical representation of the modelled layout.

Figure 2: ADMS-6 Model Layout



2.0 Legislation Guidance and Policy

2.1 Guidance

2.1.1 The following legislation and guidance will be considered during the preparation of the odour dispersion modelling assessment:

- The Environmental Permitting (England and Wales) (Amendment) Regulations 2016;
- H4: Odour Management, Environment Agency (EA), 2011[1];
- Odour Guidance for Local Authorities (withdrawn), Department for Environment, Food and Rural Affairs (DEFRA), 2010[2]; and
- Guidance on the Assessment of Odour for Planning, IAQM, 2018[3].

2.2 Odour Benchmark Levels

Environment Agency: H4

2.2.1 The H4 guidance provides benchmark levels to assess relevant exposure to determine impacts from potential operations and practices regulated under the Environmental Permitting (England and Wales) Regulations (2016) and subsequent amendments.

2.2.2 Modelled concentrations above the relevant benchmark levels detailed in Table 2 would therefore indicate unacceptable odour exposure. Benchmark levels are stated as the 98th percentile (%ile) of hourly mean concentrations in ou_E over a year. This means benchmarks should not be exceeded for more than 2% of the hours in a year or approximately 175 hours per year. This takes account of a reasonable amount of tolerance that can be expected by subjects to occasional odours. EA odour benchmark levels are summarised in Table 2.

Table 2: Odour Benchmark Levels

Relative Offensiveness of Odour	Benchmark Level as 98th%ile of 1-Hour Means (ou_E/m^3)
Most Offensive Odours: Processes involving decaying animal or fish Processes involving septic effluent or sludge Biological landfill odours	1.5
Moderately Offensive Odours: Intensive livestock rearing Fat frying (food processing) Sugar beet processing Well aerated green waste composting	3.0

[1] H4: Odour Management, Environment Agency (EA), 2011

[2] Odour Guidance for Local Authorities, DEFRA, 2010

[3] Guidance on the Assessment of Odour for Planning, IAQM, 2018 – Version 1.1.

Relative Offensiveness of Odour	Benchmark Level as 98th%ile of 1-Hour Means (ou_E/m^3)
Less Offensive Odours: Brewery Confectionery Coffee roasting Bakery	6.0

2.2.3 It was considered that odours from the proposed Facility would be comparable to those for "intensive livestock" and "well aerated green waste composting".

2.2.4 Odours generated by the facility are therefore classified as 'moderately offensive', in accordance with the EA assessment criteria shown in Table 2, and the benchmark level of 3 ou_E/m^3 is appropriate.

2.2.5 To provided context to the above benchmarks the EA guidance "Review of Odour Character & Thresholds[4]" states that the point of odour detection is 1 ou_E/m^3 based on laboratory testing of a panel of qualified assessors, with concentrations of 5 ou_E/m^3 and 10 ou_E/m^3 considered as faint and distinct odours, respectively. The guidance also states that It is important to recognise that published odour detection thresholds apply to population averages, not to individuals.

2.3 Institute of Air Quality Management Guidance

2.3.1 The IAQM guidance[3] specifically deals with assessing odour impacts for planning purposes, namely potential effects on amenity. The significance of impacts was also assessed through the interaction of the predicted 98th%ile of 1-hour mean odour concentrations and receptor sensitivity, as outlined below in Table 3.

Table 3: Odour Receptor Sensitivity

Sensitivity	Description
High	Surrounding land where: • Users can reasonably expect enjoyment of a high level of amenity; and • People would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land • Examples may include residential dwellings, hospitals, schools/education and tourist/cultural
Medium	Surrounding land where: • Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • People would not reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land • Examples may include places of work, commercial/retail premises, and playing/recreation fields
Low	Surrounding land where: • The enjoyment of amenity would not reasonably be expected; or • There is transient exposure, where the people would reasonably be expected to present only for limited periods of time as part of the normal pattern of use of the land. • Examples may include industrial use, farms, footpaths, and roads

2.3.2 The receptor sensitivity detailed above is the combined with predicted 1-hour mean odour concentrations to determine the odour impact which enables a judgment of overall significance.

[4] Review of Odour Character and Thresholds, Science Report: SC030170/SR2, Environment Agency, March 2007

3.0 Dispersion Modelling Inputs

3.1 Scope

3.1.1 The operation of the facility will result in odour emissions during normal operations. These were assessed in accordance with the following stages:

- Identification of odour sources;
- Identification of odour emission rates;
- Dispersion modelling of odour emissions; and
- Comparison of modelling results with relevant criteria.

3.1.2 The following Sections outline the methodology and inputs used for the assessment.

3.2 Process Description and Potential Odour Sources

3.2.1 Potential odour sources were identified from the following processes. These included:

- Exposed grass, whole crop, maize, and straw within energy crop silage clamps;
- Exposed FYM, poultry litter and vegetable and fruit waste stored within the concrete pad adjacent to the energy crop silage clamps;
- Agitated feedstocks along transfer routes from the silage clamps and concrete pad to the feed hoppers;
- Agitated feedstock material within the feeder hopper;
- Solid digestate within the separator bunker;
- Storage of liquid digestate in the onsite lagoon;
- Air released during filling and emptying of the pasteurisation tanks; and
- Emission from road tankers at digestate filling points.

3.2.2 The AD process is sealed and therefore does not form a source of odour, or other emissions such as CH_4 or hydrogen sulphide (H_2S), under normal operation. Should releases of these species occur then this would indicate a fault with the plant and immediate remedial measures would be taken to eliminate the problem to avoid seriously affecting the AD process.

3.2.3 Delivery of FYM, poultry litter and fruit and vegetable waste will be delivered throughout the year on a continual basis. The majority of energy crop feedstocks will be delivered during July and October, coinciding with the harvest season.

3.2.4 Once delivered, energy crops will be quickly compacted, covered, and sealed within the two silage clamps. It is expected that maximum proposed storage on site is 4 to 6 months. Fruit and vegetable waste will be stored for a maximum of 48 hours on the concrete pad adjacent to the silage clamps where it will remain covered. A maximum of 72 hours of pig and cattle FYM mixed with straw and boiler and poultry litter (broiler and layer) is to be stored on the concrete pad at any one time. Both FYM and poultry litter will remain covered.

3.2.5 Feedstocks are transferred from respective clamp or pad by telehandler into the respective feeder hoppers for approximately 2 hours per day.

3.2.6 Following the AD process, the digestate will be pasteurised to stabilise it and remove pathogens. Following pasteurisation the solid and liquid digestate are separated, the solid fraction is stored within the separator bunker for a maximum of 72 hours. Portions of liquid fraction are either directed to the recirculation tank to return to the AD process or transported via piping to the onsite digestate lagoon.

3.2.7 The tanker collection points will be accessed a maximum of 7 times per month from February to September, inclusive. During tanker filling there is the potential for short term odour emissions from displaced air within the tanker.

3.2.8 The combined heating and power unit, auxiliary boiler, emergency flare and backup diesel generator will only emit products of combustion which do not typically have any significant odours. As such, they have not been considered as potential sources in the context of this assessment. Reference should be made to CRM.0163.002.AQ.R.001 for the assessment of associated on-site combustion pollutant emissions. The Biogas Upgrading Unit effectively captures CO_2 emissions and scrubs both H_2S and Particulate Matter (PM) emissions within the raw gas via adsorption methods, activated carbon and particulate filters. H_2S is considered as an odourous emission and was included as an odour emission source in the assessment.

3.2.9 The silage clamps, FYM manure, poultry litter, and vegetable and fruit wastes will be fully covered by an appropriate silage film to provide a robust impermeable oxygen barrier film to block the entry of oxygen into material. The feedstocks will be kept covered all times except when loading or unloading which would contain odour emissions. As such, insignificant emissions are expected from covered feedstocks, with odour releases modelled from the exposed areas during loading into the feeder hoppers.

3.3 Dispersion Modelling

3.3.1 Dispersion modelling was undertaken using ADMS 6 (v6.0.0.1), which is developed by Cambridge Environmental Research Consultants (CERC) Ltd and accepted by the EA. Reference should be made to Figure 2 for a graphical representation of the modelled odour sources.

3.4 Modelling Scenarios and Emissions

3.4.1 The scenarios considered in the modelling assessment are summarised in Table 4.

Table 4: Dispersion Modelling Scenarios

Pollutant	Modelled As	
	Short Term	Long Term
Odour	98th%ile 1-hour mean	n/a

3.4.2 Information for specific odour sources were based on a review of existing literature and odour monitoring data reported at similar facilities. Emission rates are summarised in Table 5.

Table 5: Odour Emission Rates

Source	Emission Rate	Unit	Reference
Maize	20.0	ou_E/m2/s	Odournet UK Ltd[1]
Silage Energy Crops	18.7	$ou_E/m^2/s$	REC Ltd[2]
Poultry Manure (Broiler)	77.0	$ou_E/m^2/s$	Sniffer[3]
Poultry Manure (Layer)	61.0	$ou_E/m^2/s$	Sniffer[3]
Pig Manure	20.0	$ou_E/m^2/s$	Sniffer[3]
Cattle manure	0.8	$ou_E/m^2/s$	Odournet UK Ltd[5]

Source	Emission Rate	Unit	Reference
Pig manure	1.35	$ou_E/m^2/s$	Odournet UK Ltd(5)
Vegetable and Fruit Waste	50.0	$ou_E/m^2/s$	Earthcare Technical Ltd(4)
Dewatered Digestate	10.0	$ou_E/m^2/s$	Odournet UK Ltd(5)
Dewatered Digestate	2.8	$ou_E/m^2/s$	Odournet UK Ltd(7)
Digestate Lagoon and Surface Rainwater Runoff Lagoon	1.0	$ou_E/m^2/s$	University of Liège and Universidad Politécnica de Valencia(7)
Liquid digestate tanker vehicle	10,000	ou_E/m^3	Odournet UK Ltd(7)

Notes:

(1) Odour Impact Assessment for a proposed Crop CHP Plant at Stoke Bardolph, Nottinghamshire, Odournet UK Ltd;

(2) Odour Impact Assessment for a proposed Crop AD Plant at Iretons Way, Chatteris, Cambridgeshire, REC Ltd;

(3) Sniffer ER26: Final Report March / 2014, SCAIL-Agriculture update;

(4); Air Quality and Odour Impact Assessment to Support a Planning Application for an AD facility at Copland Way, Copland Way, Ellough, Beccles, Earthcare Technical Ltd, February 2022

(5) Odour Impact Assessment for a proposed Anaerobic Digestion facility near Kenninghall, Norfolk, Odournet UK Ltd

(6) Multi-method Monitoring of Odor Emissions in Agricultural Biogas Facilities, Jacques Nicolas, Gilles Adam, Yolanda Ubeda, Anne-Claude Romain, University of Liège and Universidad Politécnica de Valencia

(7) Odour Impact Assessment for a proposed Anaerobic Digestion facility in Chatteris, Cambridgeshire, Odournet UK Ltd

3.4.3 As indicated in Table 5 the maximum odour emission rate relating to the energy crops would be derived from maize feedstocks. The energy crops are proposed to be c.53% maize, c.16% grass, c.21% straw and c.10% whole crop. All odour emissions from the silage clamp were assumed to be that from maize as a conservative approach.

3.4.4 FYM and litter feedstocks are proposed to be made up of c.57% poultry litter (broiler and layer) and c.43% pig/cattle manure in straw. As shown in Table 5 the odour emission rate for cattle and pig manure is much lower than that for poultry litter; with broiler litter more odourous than layer litter. To ensure a conservative assessment, all odour emissions from the concrete pad, transfer routes and relevant feeder hoppers were assumed to be that from boiler litter.

3.4.5 Pig and cattle manures are estimated to be mixed with straw which would result in a 50% reduction on odour emission rates as suggested by the Sniffer report(3). However, as the composition of straw within the manure is unknown no reduction has been applied. Furthermore, all FYM was modelled as broiler litter to ensure a conservative approach.

3.4.6 The digestate emissions from the pasteuriser tanks will be undergoing a drying process and therefore the higher of the values, 10 $ou_E/m^2/s$, was used for this assessment to represent the expelled air from these tanks. Following pasteurisation the digestated is separated into solid and liquid fractions. The solid fraction collects in a bunker underneath the separator which is regularly removed from the site by tractor/trailer. The digestate will be covered and enclosed, however, to assume a conservative approach, solid digestate was modelled as an uncovered enclosed source.

3.4.7 The digestate lagoon will receive liquid digestate from the AD proposed. The liquid digestate lagoon will be covered by impermeable floating cover which will reduce emissions considerably by avoiding exposure to meteorological conditions. A comparable emission rate of 0.5 $ou_E/m^2/s$ has been applied and considers a reduction of 50% associated with the proposed floating cover.

3.4.8 The emission rates shown in Table 5 were utilised with additional information provided for the Facility to define emissions within the dispersion model. These are summarised in Table 6.

Table 6: Emissions

Source	Modelled Height (m)	Odour Emission Rate	Unit	Characteristics
O1: Silage Clamp 1	3.5	20	ouE/m^2/s	c. 40m^2 of FYM exposed constantly within the clamp
O2: Silage Clamp 2	3.5	200.0*	ouE/m^2/s	c. 40m^2 of agitated FYM exposed constantly within the clamps
O3: Litter and FYM Pad	2.5	770.0*	$ou_E/m^2/s$	c. 17m^2 of agitated FYM exposed within the pad for 2 hours per day
O4: Vegetable and Fruit Waste Pad	2.5	500.0*	$ou_E/m^2/s$	c. 7m^2 of agitated vegetable and fruit waste exposed within the pad for 2 hours per day
O5: Feeder Hopper 1	4.3	770.0*	$ou_E/m^2/s$	c. 40m^2 of agitated FYM within the feeder for 2 hours per day
O6: Feeder Hopper 2	5.1	200.0*	$ou_E/m^2/s$	c. 50m^2 of agitated silage within the feeder for 2 hours per day
O7: Digestate Lagoon	0.0	1.0	$ou_E/m^2/s$	c.2,260m^3 of constantly exposed lagoon areas
O8: Main Transfer	2.0	770.0*	$ou_E/m^2/s$	1m wide main route from clamp/pad to feeders of agitated FYM, 2 hours per day.
O9: Transfer Clamp 1	2.0	200.0*	$ou_E/m^2/s$	1m wide route from Silage Clamp 1 to main transfer. Agitated silage for 2 hours per day.
O10: Transfer Clamp 2	2.0	200.0*	$ou_E/m^2/s$	1m wide route from Silage Clamp 2 to main transfer. Agitated silage for 2 hours per day.
O11: Transfer Pad	2.0	770.0*	$ou_E/m^2/s$	1m wide route from concrete pad to main transfer. Agitated FYM for 2 hours per day.
O12: Transfer Hopper 1	2.0	770.0*	$ou_E/m^2/s$	1m wide route from concrete pad to Feed Hopper 1. Agitated FYM, 2 hours per day.
O13: Transfer Hopper 2	2.0	200.0*	$ou_E/m^2/s$	1m wide route from Silage Clamps to Feed Hopper 2. Agitated silage, 2 hours per day.
O14: Digestate Separator	2.5	10	$ou_E/m^2/s$	c.50m^2 of solid digestate exposed constantly within the bunker
O15: Pasteurisation Tanks	5.0	10	$ou_E/m^2/s$	c. 0.33m^2 cross sectional area of the vent for the 15m^3 tank. With an air exchange of 1 hours. Flow rate of 0.004 m^3/s
O16: Liquid Digestate Station	0.5	83.33	ou_E/s	15m^3 tank air expelled over 1,800 seconds, flow rate of 0.008 m^3/s
O17: Biogas Upgrading Unit	6.0	151.39	ou_E/s	Stack Height: 6m Stack Diameter: 0.08m Volumetric flow rate: 0.151 m^3/s Velocity: 30.12 m/s

** Agitated or disturbed feedstocks represented by an increased emission rate of 10 times that of typical rates.*

3.4.9 The emission characteristics summarised within Table 6 include the following assumptions.

Exposed maize, grass, whole crop, and straw within silage clamps

3.4.10 The area of the silage clamps constantly uncovered represents an exposed face of the silage along its entire length and height. The uncovered clamp area will vary throughout operation depending on the levels and type of stored feedstock. As such, the assumption that both faces of the clamps will be exposed at all times would provide a conservative approach. The clamps are 25 m wide each and feedstocks are expected to be 7.5 m in height. It has been assumed the clamps are exposed during operations which occur for one hour twice a day. This was applied to sources O1 and O2.

FYM and Vegetable and Fruit Waste stored with the manure pad

3.4.11 The emissions for FYMs and poultry litter are given for pure and raw manures and based on 100% poultry manure to assume a robust emission profile, although 43% of the FYM feedstock is to comprise of pig and cattle manure mixed with straw.

3.4.12 JEDI UK Ltd confirmed that all feedstock stored on the pad are to be covered, with only the front face of the feedstocks exposed for twice a day for one hour during loading. It is understood the FYM storage holds a maximum of 72 hours of feedstock at any one time, with 48 hours of vegetable and fruit in the pad at any one time. The feedstocks will be fully covered and exposed and agitated for approximately 2 hours per day. This was applied to sources O3 and O4.

Exposed and agitated material within the feeder hoppers

3.4.13 The agitation of feedstock during loading into the feeder hoppers was represented by an increased emission of 10 times that of the standard rate. The feeding process of all feedstocks occurs 2 hours per day. This was applied to sources O5 – O6 with FYM and silage emission rates assigned to each of the respective feed hoppers.

Transfer from feedstock clamp/pad to feeder hoppers

3.4.14 The transfer route from the silage clamps (O10, O11, 013) to Feed Hopper 1 (O5) and FYM/vegetable and fruit waste pad (O12, O14) to Feed Hopper 2 (O6) was modelled as a 1.0 m wide area source, the maximum distance was used for the routes from the silage clamps and concrete pad to the feeder hoppers. The agitation of feedstock during transfer to the feeder hoppers was represented by an increased emission of 10 times that of the standard rate.

Emissions from solid digestate

3.4.15 Processed solid and dewatered digestate is separated and temporarily stored within a dedicated area which is enclosed and covered. The solid digestate will stay in situ for a maximum of 72 hours before transferred off site. Emission rates are conservative and based on an uncovered and open source which does not consider potential emissions reductions as a result of covering digestate.

Emissions from Digestate Lagoon

3.4.16 The digestate lagoon will be fitted with a floating cover which will reduce the fugitive emission rates; no reduction has been applied. However, the lagoon will consist of proportions of leachate runoff which will dilute the digestate and reduce the emission rate. To account for this the emission rate was reduced by 50%.

Emissions from Pasteurisation Tanks

3.4.17 The emissions from the pasteurisation tanks are based on an average displaced air flow of 15 m^3/hr from a full 15m^3 tank based on the proposed tank filling rate. The pasteurisation tanks emit via a dedicated vent with a diameter of 0.65 m and a flow of 0.004 m^3/s and a velocity of 0.013 m/s.

Emission from road tankers at digestate filling points

3.4.18 The liquid fraction of the digestate is stored in the digestate tank before being transported off-site by tankers to use as a fertiliser on local agricultural land. Tankers are assumed to have a 15 m^3 capacity and a filling time of 30 minutes has been used to calculate an air flow rate of 0.008 m^3/s and a velocity of 0.265 m/s.

Emission from Biogas Upgrading Unit

3.4.19 Emission concentrations stated in EA statutory guidance "SR2021 No 6: Anaerobic digestion facility, including use of the resultant biogas – installations"[5]. Modelled stack height of 6m, diameter 0.08 m, flow rate of 0.151 m^3/s and a velocity of 30.12 m/s emitting constantly during operations.

3.4.20 All odour emissions were at ambient velocity and temperature as a realistic assumption.

3.5 Time Varied Emissions

3.5.1 Emissions for the liquid digestate lagoon, digestate storage, biogas upgrade and pasteurisation tanks were assumed to be constant, with the plant in operation 24-hours per day, 365-days per year.

3.5.2 JEDI UK Ltd confirmed that the filling of the feeder hoppers, as well as the transfer of feedstock from the silage and FYM, poultry litter and vegetable and fruit waste pad would occur for approximately two hours per day. The silage clamps and feedstocks stored on the concrete pad will remain fully covered when not required for transfer to the feed hoppers and therefore exposed for two hours per day. A time-varied file was applied to represent these emissions.

3.5.3 JEDI UK Ltd confirmed that the collection of liquid digestate from the designated transfer point will occur for a maximum of 11 times per month. Therefore, a time-varied file was applied to represent 1 collection per a day as a robust assumption.

3.5.4 Modelling of all sources is therefore considered to provide conservative short-term pollutant concentration predictions which do not account for periods of reduced workload.

3.6 Assessment Extents

3.6.1 Ambient concentrations were modelled over a 10 km x 10 km area using a nested grid with variable resolutions and distances. The grid comprises the following spacing:

- 5m resolution - within 200 m of the Facility;
- 25 m resolution - within 400 m of the Facility;
- 50 m resolution - within 1,000 m of the Facility;

[5] https://www.gov.uk/government/publications/sr2021-no-6-anaerobic-digestion-facility-including-use-of-the-resultant-biogas-installations/sr2021-no-6-anaerobic-digestion-facility-including-use-of-the-resultant-biogas-installations

- 250 m resolution - within 2,000 m of the Facility; and
- 500 m resolution - within 5,000 m of the Facility.

Results were subsequently used to produce contour plots within the Surfer® visualisation software package.

Sensitive receptor locations in the vicinity of the Facility were identified following a desk top survey and assigned a relevant sensitivity based on the appropriate land use category and criteria detailed in Table 3.

3.6.2 Sensitive receptors are summarised in Table 7. Reference should be made to Figure 3 for a graphical representation of the receptor locations.

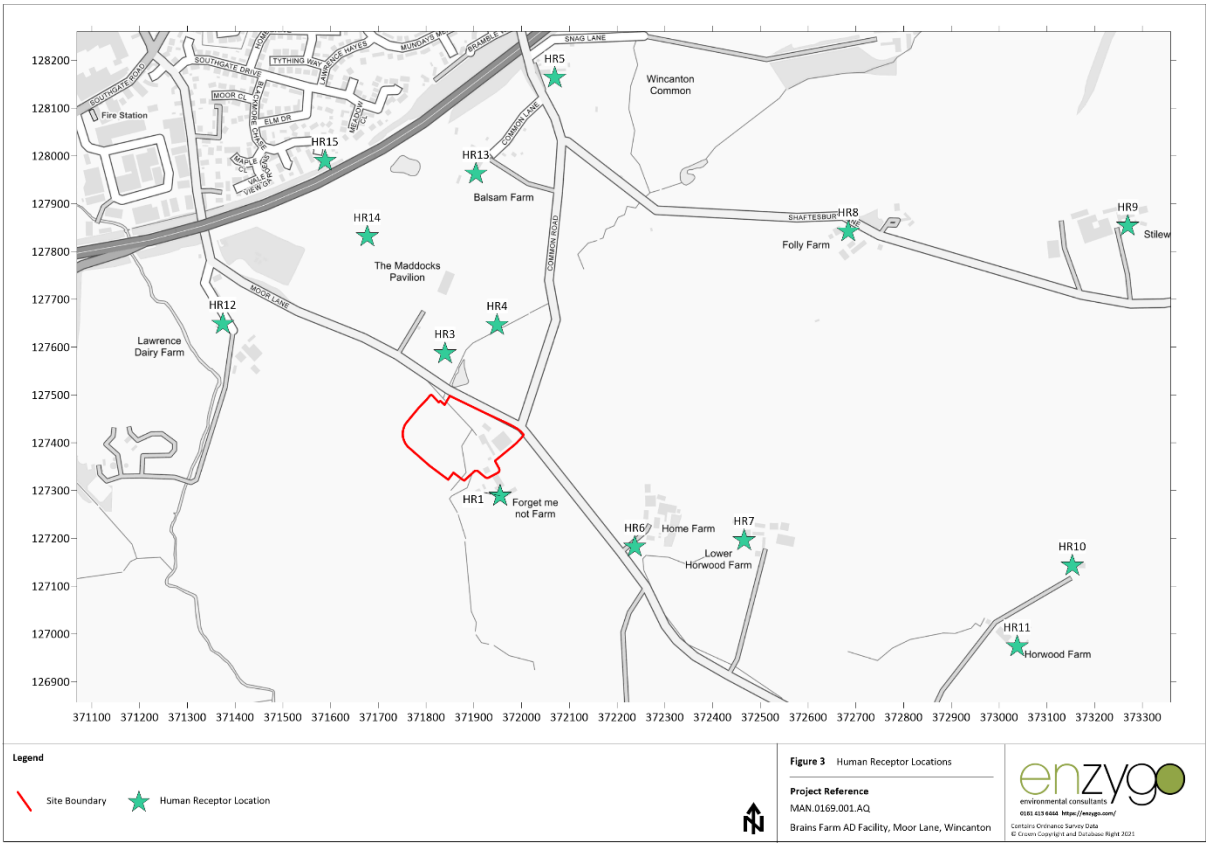
Table 7: Human Sensitive Receptors

Receptor		Use	NGR (m)		Distance from Facility (m)	Sensitivity
			X	Y		
HR1	Forget Me Not Farm	Residential	371955.0	127289.0	137	High
HR2	Wincanton Sports Ground	Recreational	371839.5	127587.0	137	Medium
HR3	Wincanton Sports Ground	Recreational	371948.9	127645.9	189	Medium
HR4	Vine House, Common Road	Residential	372069.5	128163.2	254	High
HR5	Home Farm	Residential	372237.1	127182.1	785	High
HR6	Lower Horwood Farm	Residential	372466.1	127196.0	421	High
HR7	Folly Farm	Residential	372684.1	127842.0	623	High
HR8	Stileaway Farm	Residential	373269.7	127853.3	919	High
HR9	Higher Horwood Farm	Residential	373153.4	127142.7	1,463	High
HR10	Higher Horwood Farm Cottage	Residential	373037.8	126974.0	1,302	High
HR11	Lawerence Dairy Farm	Residential	371374.1	127648.4	1,236	High
HR12	Balsam Farm	Residential	371904.4	127962.3	561	High
HR13	Allotments, Moor Lane	Residential	371676.7	127831.2	561	High
HR14	40 Blackmore Chase	Residential	371588.3	127989.5	474	High

3.6.3 It should be noted that surrounding land use is predominantly agricultural so silage and FYM odours would reasonably be expected. Many of the receptors in close vicinity to the Facility are working farms however receptors represent a group of properties and range of uses. HR1 represents an approved barn conversion to residential use within the curtilage of Forget Me Not Farm. The planning application 14/05207/PAMB was submitted in 2014 and approved at subject to conditions. The current status of the application and progression with construction is unknown and a receptor was included for completeness.

3.6.4 In all cases, receptors have been classified as the highest sensitivity in that group, such as a residential farmhouse within the curtilage of the farm.

Figure 3: Modelled Sensitive Receptor Locations



3.7 Terrain Data

3.7.1 Areas of complex terrain have potential to affect the dispersion of pollutants which vary dependent on the height and location of modelled emission sources. The ADMS-6 user guidance suggest that terrain height effect should only be included where gradient exceed 1:10.

3.7.2 Ordnance Survey Landform Panorama terrain data processed within the ADMS-6 model and covers the Facility and surrounding receptor locations.

3.8 Building Effects

3.8.1 Buildings can influence the dispersion of pollutant and may lead to increases to ground level concentrations. A review of adjacent buildings was therefore undertaken and subsequently included within the model and are summarised in Table 8.

3.8.2 Onsite building heights were provided by Burton Agnes Renewables. It should be noted that the effect of buildings on dispersion can only be modelled for points source. As such the modelled area/line sources do not take account of building effects.

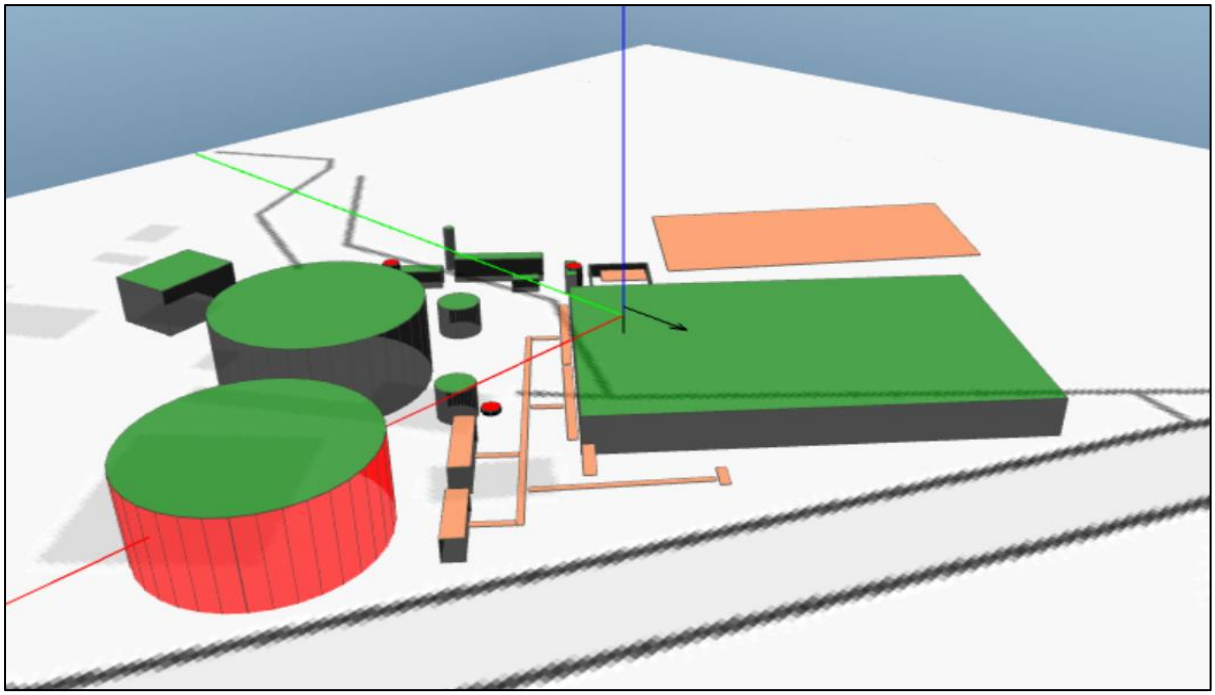
Table 8: Building Geometries

Building		NGR (m)		Height (m)	Length/ Diameter (m)	Width (m)	Angle (°)
		X	Y				
1	TNV Digester	371956.8	127418.7	16.0	35.5	Circular	N/A
2	Post Digester	371924.4	127387.5	16.0	35.5	Circular	N/A
3	Feed Hopper 1	371940.0	127439.2	4.2	11.9	3.3	224.4
4	Feed Hopper 2	371927.5	127426.4	5.0	3.4	14.9	134.4
5	Silage Clamps	371868.1	127443.8	7.5	75.7	49.2	130.3

Building		NGR (m)		Height (m)	Length/ Diameter (m)	Width (m)	Angle (°)
		X	Y				
6	Liquid Tanks 1	371917.7	127413.6	6.5	6.6	Circular	N/A
7	Liquid Tanks 2	371896.2	127389.6	6.5	7.6	Circular	N/A
8	Site Office	371927.0	127344.0	10.0	12.6	16.4	169.6
9	Grid Entry Units	371903.2	127355.9	3.5	9.1	4.1	226.0
10	Biogas Upgrader	371891.3	127363.7	4.0	3.3	19.5	225.4
11	CHP Unit	371874.5	127376.8	5.5	3.0	17.9	225.7
12	Boiler Unit	371874.8	127384.9	3.0	2.5	5.3	222.2
13	Pasteurisation Units	371867.6	127390.7	4.5	2.2	7.5	134.3
14	Flare	371877.7	127365.3	3.0	2.0	Circular	N/A
15	Digestate Bunker Wall	371856.3	127401.8	3.0	0.2	10.2	133.8
16	Digestate Bunker Wall	371864.9	127393.6	3.0	0.2	10.2	133.8
17	Digestate Bunker Wall	371857.2	127394.1	3.0	0.3	12.0	223.8

3.8.3 Reference should be made to Figure 2 for a graphical representation of the modelled building layout and ADMS-6 model inputs. A three-dimensional representation is provided below.

Figure 4: 3D Model Layout

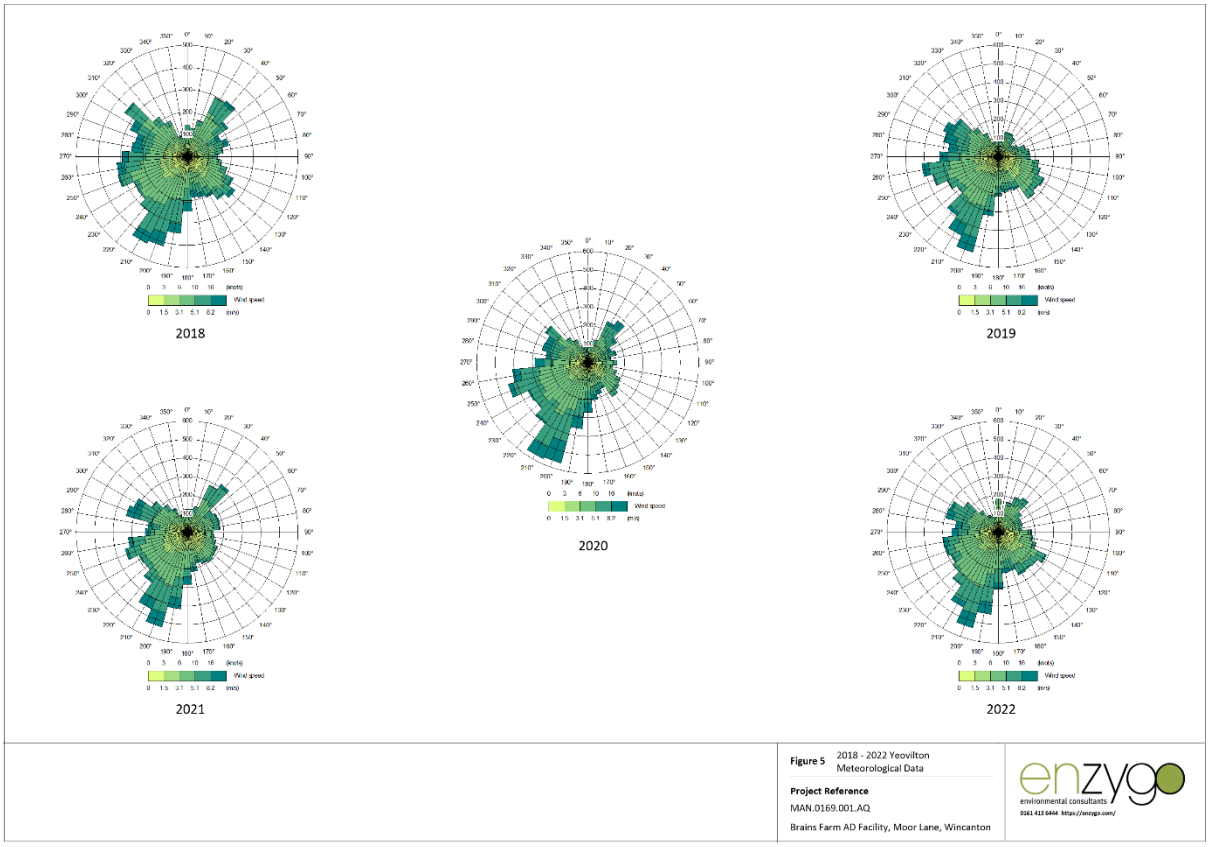


3.9 Meteorological Data

3.9.1 Hourly sequential data used in this assessment was obtain from Yeovilton meteorological station, located 17 km southwest of the Facility. Both sites are located within similar rural contexts and share comparable topographies. The choice of this parameter therefore provides a suitable representative of metrological conditions across the modelled domain.

3.9.2 Maximum emissions across the five years of meteorological data (2018 - 2022) were utilised to ensure a worse case assessment. Reference should be made to Figure 5 for the meteorological wind roses.

Figure 5: Meteorological Wind Roses



3.9.3 All meteorological data was provided by ADM Ltd.

3.10 Roughness Length

3.10.1 The specific roughness length (z_0) values specified with the ADMS-6 model are summarised in Table 9.

Table 9 Utilised Roughness Length

Location	Roughness length (m)	ADMS Description
Application Site and Meteorological Station	0.2	Agricultural (min)

3.11 Monin-Obukhov Length

3.11.1 The Monin-Obukhov length values are summarised in Table 10.

Table 10 Utilised Monin-Obukhov Lengths

Location	Monin-Obukhov length (m)	ADMS Description
Application Site and Meteorological Station	10	Small Towns <50,000

3.12 Surface Albedo and Priestley-Taylor Parameter

3.12.1 The surface albedo and Priestley-Taylor parameters used in the assessment were the model default values of 0.23 and 1 respectively.

3.13 Significance of Odour Impacts

3.13.1 Modelled 98th%ile of 1-hour mean odour concentrations were compared against the EA benchmark levels to determine the acceptability of the impacts.

3.13.2 To provide a further examination of significance, the impacts was also assessed through the interaction of the predicted 98th%ile of 1-hour mean odour concentrations and receptor sensitivity, as outlined in the IAQM guidance[3]. The relevant assessment matrix for "moderately offensive odours" as defined in Section 2.2 is summarised in Table 11.

Table 11 IAQM Odour Impact Descriptors

Odour Exposure Level as 98th%ile of 1-Hour Means (ou_E/m^3)	Receptor Sensitivity		
	Low	Medium	High
Greater than 10	Moderate	Substantial	Substantial
5 – 10	Slight	Moderate	Moderate
3 – 5	Negligible	Slight	Moderate
1.5 – 3	Negligible	Negligible	Slight
0.5 – 1.5	Negligible	Negligible	Negligible
Less than 0.5	Negligible	Negligible	Negligible

3.13.3 The IAQM guidance states that an assessment must reach a conclusion on the likely significance of the predicted impact. Where the overall effect is moderate or substantial, the effect is likely to be considered significant, whilst if the impact is slight or negligible, the impact is likely to be considered not significant.

3.14 Modelling Uncertainties

3.14.1 Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:

- Model uncertainty – due to model limitations;
- Data uncertainty – due to errors in input data, including emission estimates, operational procedures, land use characteristics and meteorology; and
- Variability – randomness of measurements used.

3.14.2 Whilst uncertainty in the model inputs and parameters cannot be fully reduced, the analysis of maximum emissions across the five years of meteorological data (2018 - 2022) provides sensitivity analysis which sufficiently accounts for variations in modelled predictions. Additionally, robust assumptions applied during the calculation of emission rates within the model also minimise potential uncertainties and underpredictions. As such, a sufficient degree of confidence can be placed in the results.

3.15 Dispersion Modelling Report Requirements

3.15.1 Table 12 provides the checklist of dispersion modelling report requirements.

Table 12 Dispersion Modelling Report Requirements

Item	Location within Report
Location map	Figure 1
List of odours modelled and relevant odour guidelines	Section 3.2, Section 2.2 and Table 2
Details of modelled scenarios	Section 3.4
Details of relevant ambient concentrations used	Not relevant to odour
Model description and justification	Section 3.3
Special model treatments used	Section 3.0
Table of emission parameters used	Table 5 and Table 6
Details of modelled domain and receptors	Section 3.6, Table 7 and Figure 3
Details of meteorological data used	Section 3.9
Details of terrain treatment	Section 3.7
Details of building treatment	Section 3.8, Table 8, and Figure 2

4.0 Assessment

4.1 Sensitive Receptor Results

4.1.1 Predicted odour concentrations at receptor locations are summarised in Table 13. Odour concentrations are presented as a 98th%ile of 1-hour mean values over the relevant assessment year. The maximum concentration over the 5 year meteorological dataset has been used to determine the overall assessment significance.

Table 13 Predicted Odour Concentrations

Receptor		Predicted 98th%ile 1-hour Mean Concentration (ou_E/m^3)					
		2018	2019	2020	2021	2022	5-Year Max Mean
HR1	Forget Me Not Farm	1.34	1.13	0.80	1.14	1.17	1.34
HR2	Wincanton Sports Ground	1.20	1.36	1.22	1.15	1.56	1.56
HR3	Wincanton Sports Ground	1.04	1.05	1.41	1.91	1.76	1.91
HR4	Vine House, Common Road	0.13	0.15	0.13	0.17	0.17	0.17
HR5	Home Farm	0.32	0.29	0.24	0.32	0.26	0.32
HR6	Lower Horwood Farm	0.17	0.18	0.16	0.17	0.17	0.18
HR7	Folly Farm	0.08	0.09	0.09	0.09	0.08	0.09
HR8	Stileaway Farm	0.03	0.03	0.04	0.03	0.03	0.04
HR9	Higher Horwood Farm	0.04	0.05	0.04	0.05	0.04	0.05
HR10	Higher Horwood Farm Cottage	0.05	0.05	0.04	0.05	0.05	0.05
HR11	Lawerence Dairy Farm	0.18	0.28	0.18	0.21	0.27	0.28
HR12	Balsam Farm	0.21	0.21	0.21	0.23	0.25	0.25
HR13	Allotments, Moor Lane	0.23	0.23	0.21	0.27	0.29	0.29
HR14	40 Blackmore Chase	0.12	0.12	0.12	0.13	0.16	0.16

4.1.2 As indicated in Table 13, predicted odour concentrations were below the appropriate odour benchmark of 3.0 ou_E/m^3 at all highly sensitive receptor locations for all modelling years.

4.2 IAQM Guidance Impact Significance

4.2.1 The significance of predicted odour impacts at the sensitive receptors based on 5-year maximum concentrations using IAQM guidance[3] is summarised in Table 14. Impacts are based on the criteria given in Table 11.

Table 14 Predicted Impact Significance at Receptors

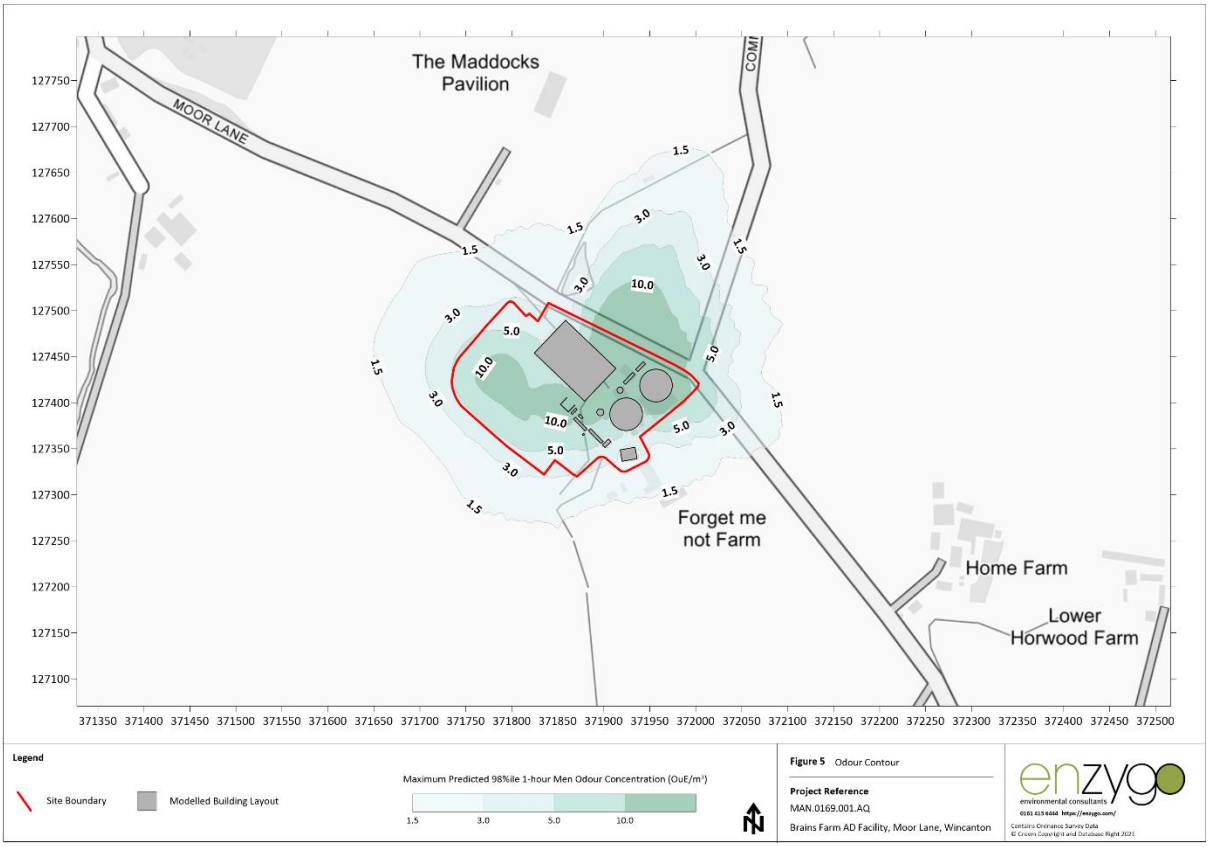
Receptor		Maximum Concentration (ou_E/m^3)	Odour Exposure Level (ou_E/m^3)	Receptor Sensitivity	Significance of Impact
HR1	Forget Me Not Farm	1.34	0.5 - 1.5	High	*Slight*
HR2	Wincanton Sports Ground	1.56	1.5 - 3	Medium	*Slight*
HR3	Wincanton Sports Ground	1.91	1.5 - 3	Medium	*Slight*
HR4	Vine House, Common Road	0.17	Less than 0.5	High	Negligible
HR5	Home Farm	0.32	Less than 0.5	High	Negligible
HR6	Lower Horwood Farm	0.18	Less than 0.5	High	Negligible
HR7	Folly Farm	0.09	Less than 0.5	High	Negligible

Receptor		Maximum Concentration (ou_E/m^3)	Odour Exposure Level (ou_E/m^3)	Receptor Sensitivity	Significance of Impact
HR8	Stileaway Farm	0.04	Less than 0.5	High	Negligible
HR9	Higher Horwood Farm	0.05	Less than 0.5	High	Negligible
HR10	Higher Horwood Farm Cottage	0.05	Less than 0.5	High	Negligible
HR11	Lawerence Dairy Farm	0.28	Less than 0.5	High	Negligible
HR12	Balsam Farm	0.25	Less than 0.5	High	Negligible
HR13	Allotments, Moor Lane	0.29	Less than 0.5	High	Negligible
HR14	40 Blackmore Chase	0.16	Less than 0.5	High	Negligible

4.2.2 As indicated in Table 14, the significance of odour impacts as a result of the Facility was predicted to be negligible at 11 sensitive receptor locations and slight at 3 sensitive receptor locations.

4.2.3 Based on the assessment results, the overall odour impact associated with the proposed activities are considered acceptable and not significant in accordance with the stated methodology and the IAQM impact descriptors listed in Table 10. Figure 5 presents the 5-year maximum a contour plot across the modelling domain.

Figure 6: Maximum 5-year Odour Concentrations



5.0 Conclusions

5.1.1 Enzygo Ltd was commissioned by JEDI UK Ltd to undertake detailed odour dispersion modelling to support a permit application relating to an AD plant at Brains Farm, Wincanton (the 'Facility').

5.1.2 During the operation of the Facility there is the potential for impacts at sensitive locations due to odour emissions from a number of sources at the plant. An Odour Assessment was therefore undertaken to consider effects in the vicinity of the site.

5.1.3 Potential odour emissions were defined based on information provided by JEDI UK Ltd on the facilities operation and a review of available literature and industry standard emission rates used at similar facilities. Where necessary conservative assumptions were made to give a robust assessment and increased confidence in the results.

5.1.4 A dispersion model using ADMS 6 and 5 years' meteorological data was produced to determine associated impacts. Impacts at sensitive receptor locations in the vicinity of the site were quantified, the maximum predicted results compared with the appropriate odour benchmark level.

5.1.5 Predicted odour concentrations were below the EA benchmark level of 3.0 ou_E/m^3 at all sensitive receptors in the vicinity of the site for all modelled years. In addition, using the IAQM guidance[3] impact criteria, maximum impacts were slight at one residential receptor location and two recreational receptor locations. All other locations were predicted to experience negligible impacts.

5.1.6 As such, given the robust assumptions made on odour emissions, the overall odour impacts generated by the Facility can be considered as acceptable and not significant.

5.1.7 The facility is therefore not considered to represent a constraint to environmental permitting permission with regard to odour.

6.0 Abbreviations

%ile	Percentile
AD	Anaerobic Digestion
ADM	Atmospheric Dispersion Modelling
ADMS	Atmospheric Dispersion Modelling Software
CERC	Cambridge Environmental Research Consultants
CH_4	Methane
CHP	Combined Heating and Power
CO_2	Carbon Dioxide
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EPUK	Environmental Protection UK
FYM	Farmyard Manure
H_2S	Hydrogen Sulphide
HGV	Heavy Good Vehicle
IAQM	Institute of Air Quality Management
JEDI	Japan Environmental Development & Investment
NGR	National Grid Reference
ou_E	European Odour Unit
PM	Particulate Matter
tpa	Tonnes Per Annum
z_0	Roughness Length

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Appendix F – Climate Change Risk Assessment

The impact of each climate change scenario identified above has been assessed using the following criteria:

Likelihood of Impact		Severity of Impact	
Low	Unlikely	**Low**	Low impact with minor, temporary effects on the environment or human health.
Medium	Low to medium likelihood	**Medium**	Moderate impact with medium-term effects on the environment or human health.
High	Likely	**High**	Moderate to severe impact with potential for long-lasting damage to the environment or human health

The two figures are then multiplied to give the risk category. Each impact can then be prioritised as follows:

Likelihood Score	Severity	Risk Category
Low	Low	Low
Low	Medium	Medium
Low	High	Medium
Medium	Low	Low
Medium	Medium	Medium
Medium	High	High
High	Low	Medium
High	Medium	High
High	High	High

Table 8: Climate Change Risk Assessment

Impact	Likelihood	Severity	Risk	Control Measures	Residual Risk
Changing Temperatures					
Overheating of vessels and pipework at anaerobic digestion plants, requiring increased insulation and cooling.	Medium	Medium	Medium	Insulation of control and electrical systems. Critical plant and equipment are provisioned with monitoring and alarms by SCADA System. Planned Preventative maintenance is carried out and recorded in line with the EMS. PRVs are tested annually. Increased process monitoring during periods of extreme weather. Maintenance contract is in place with the equipment suppliers.	Low
Potential for increased fires involving combustible waste stockpiles.	Low	Medium	Medium	Fire risk assessments and emergency response procedures in place. Staff training with suitable fire marshals present 24hrs. Windrows will be kept to a maximum height of 3m to encourage heat loss. Moisture and temperature monitoring of feedstocks with moisture adjustment, if required.	Low
Increased changes in feedstock, low nitrogen waste (less grass) and slower processing times.	Medium	Low	Low	Management of change procedure to be followed for changes in feedstock. Monitoring of carbon to nitrogen mix and adjustment of input crops. Increased temperature and moisture monitoring and adjustment. Increased monitoring of feedstock to ensure the right organic mix to maintain digester stability.	Low
Increase in dust and bioaerosol emissions.	Medium	Medium	Medium	Damping down and sweeping operational areas daily during prolonged dry weather conditions. Monitoring bioaerosols as required by the permit. Dust monitoring during periods of prolonged dry weather. Harvesting clean water for use in operational areas and feedstock. Recirculation of leachate for new feedstock. Covering of feedstocks and digestate lagoon. Site inspections and sweeping of internal roads as required.	Low

Impact	Likelihood	Severity	Risk	Control Measures	Residual Risk
Increased pests and flies.	Medium	Medium	Medium	Contractor available to provide pest control services. Site inspections and waste acceptance procedures in place. Materials are kept covered at all times, except for during feedstock addition and removal. Digestate lagoon is covered. Treatment processes carried out within enclosed tanks and vessels.	Low
Lower gas uptake from National Grid affecting grid demand.	Low	Medium	Medium	Contingency to slow feedstock rate to lower gas yield at times when grid off-take is reduced. Combustion contingency is available in the form of the flare.	Low
Increase in odour.	Medium	Medium	Medium	Odour sources are covered or enclosed within hoppers or tanks providing protection against elements. Odour Management Plan in place. Solid digestate removed regularly and sheeted when not being loaded. Digestate lagoon is covered.	Low
Longer growing seasons resulting in a change in the feedstocks.	Low	Medium	Medium	Management of change procedure to be followed for changes in feedstock. Potential for additional off-site feedstock and digestate storage currently being explored.	Low
Poor crop yields and feedstock scarcity for anaerobic digestion could lead to reduced digester performance.	Medium	Medium	Medium	Management of change procedure to be followed for changes in feedstock. Potential for additional off-site feedstock storage currently being explored.	Low
Freezing pipelines.	Low	Medium	Medium	All pipelines and tanks are suitably insulated. Daily site inspections and SCADA system in place to monitor changes in operating conditions.	Low
Frozen onsite roadways may restrict access for staff and emergency vehicles.	Low	Medium	Medium	Gritting and clearing contractors available to clear internal roads and external access roads, if required.	Low
Damage to site infrastructure from snow-loading.	Low	Medium	Medium	No history of significant snowfall. Robust structures built to withstand severe weather conditions. Tanks and bunds constructed to CIRIAC736 standards.	Low

Impact	Likelihood	Severity	Risk	Control Measures	Residual Risk
Extreme rainfall					
Unstable process conditions causing temperature fluctuations and increased odours.	Medium	Medium	Medium	Process monitoring at increased frequency. CHP and biogas boiler can provide heat for the process when required.	Low
Land bank availability for spreading digestate may experience extreme difficulty due to prolonged wet weather.	Medium	Medium	Medium	Contingency plan in place. Up to 219 tonnes of solid digestate and 4200m^3 of liquid digestate storage available on site. Potential for additional off-site digestate storage currently being explored.	Low
Leachate storage risk of over-topping.	Medium	Medium	Medium	750mm of free board on lagoon which is covered to prevent rainwater ingress. High level alarms on large tanks, attenuation pond and lagoon. Making sure attenuation pond and dirty water storage tank levels are lowered before increased forecast rainfall. Harvesting of clean and dirty water for use in the process.	Low
Localised flood events	High	High	High	Routine tank and lagoon inspections. Site levels have been raised and a site perimeter bund and new flood alleviation area created. 750mm of free board on lagoon which is covered to prevent rainwater ingress. All main liquid storage and treatment vessels are constructed to CIRIA 736 standard and located within a sealed bunded area sized to contain 110% of the largest tanks capacity or 25% of the maximum volume of all the material stored within the bund. Contingency plan in place to divert feedstocks if site is overwhelmed, and if the landbank is not available for spreading of digestate. Flood risk assessment carried out and takes account of changes to the climate.	Low

Impact	Likelihood	Severity	Risk	Control Measures	Residual Risk
Potential for drainage systems to be overwhelmed	High	Medium	High	Routine preventative maintenance and inspection of drainage infrastructure. Waste/feedstock storage and handling areas are provisioned with separate drainage system. Dirty and clean water constantly being used within the process.	Low
Reduced access or egress due to site flooding	High	Medium	High	Emergency plan in place including staffing contingency. Contingency arrangements in place to divert feedstocks.	Low
Sea level rise					
Risk of flooding and associated impacts.	Low	Low	Low	Site and roadways into site are located 69m above sea level and not in close proximity to the sea.	Low
Drier summers					
Increased need for water for digesters.	Low	Medium	Medium	Water captured from across the site for use within the process. Water is also recirculated as part of the process.	Low
Poor crop harvest and reduced feedstock.	Low	Medium	Medium	Management of change procedure to be followed for changes in feedstock. Potential for additional off-site feedstock storage currently being explored.	Low
Changing river flow rates					
Reduced dilution available in receiving watercourse in the event of a spill, increasing potential for damage from pollution.	Low	Low	Low	Containment and secondary containment are in place to prevent spills. Accident Management Plan in place. Spill procedures.	Low
Increased flood risk due to discharge of waters during peak river flows.	Low	Low	Low	Very limited water is discharged from the site. Surface water discharge is fitted with flow control and can be shut off if required.	Low
Storms					

Impact	Likelihood	Severity	Risk	Control Measures	Residual Risk
Damage to building structures and tanks resulting in increased potential for accidental and fugitive emissions.	Low	High	Medium	Robust structures built to withstand severe weather conditions. Tanks and bunds constructed to CIRIAC736 standards. Lightning protection in place and annually serviced.	Low

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